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Water Supply Constraints to Energy Development - Phase VII

User's Manual

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1 - INTRODUCTION

1 - INTRODUCTION

The federal government has recognized a need to develop a planning tool which will assist in the examination of water availability in different parts of the country vis-a-vis the current and future requirements for water. This need is particularly evident in western Canada where rapid growth of the energy sector, coupled with growth in the agricultural sector, has caused, and will continue to cause, increasing stress on the water resource.

Inland Waters Directorate (IWD) Environment Canada, sponsored by the Department of Energy, Mines and Resources, initiated a multiphase study to develop such a planning tool. This study included a total of seven separate phases to date.

Phase I, an overview study of basic data identifying regions where water use constraints are likely to occur, was completed in 1982 and documented (Reference 1). The report forms a comprehensive background document of proposed energy developments in Canada for the period to 2001. It identifies areas likely to come under increasing water stress over the next few years based on a single projection of water uses. There was a need identified to develop a planning tool which would permit the examination of the water use of a large variety of development scenarios.

In Phase II, a basic Water Use Forecasting Model (WUFM) was developed to compare water demands with water availability on a subbasin basis. This model has been named the Water Use Analysis Model (WUAM). (All further discussions refer to the WUAM.) The model was sufficiently general to be applied throughout Canada but was tested using data from the South Saskatchewan River basin. In addition, the model was constructed in a modular format to permit simple upgrading of various components as the need was recognized and as budget became available. The model and its test applications are described in the Phase II

Summary Report, and a User's Manual for the general application of the model was also prepared (Reference 2).

In preparing the WUAM in Phase II, it became apparent that additional efforts should be made to improve the accuracy of the agricultural (irrigation) water use calculations. Phase III of the study therefore concentrated on the development of an irrigation water use submodel to be incorporated as a separate module within the WUAM. The development of this new module and corresponding test case application runs are documented in the Phase III Summary Report (Reference 3).

At the end of Phase III, an additional task involved converting the model from BASIC to FORTRAN code so that it would be more portable between computer systems.

Phase IV work expanded the capabilities of the model in analyzing the effects of specific energy projects in the basin. This included a provision for simulating the effects of off-stream storage for both these specific projects and irrigation areas. Additionally, substantial improvements were made in output reports from the final simulation, and a major data base expansion was carried out, to cover the prairie provinces portion of the Saskatchewan-Nelson basin, as documented in the Phase IV Summary Report (Reference 4).

Phase V expanded the capabilities of the model and enhanced the data base. The model enhancements which were incorporated include a detailed reservoir operation routine, a minimum apportionment flow and rationing methodology, and routines to examine price elasticity aspects of water demand. The data base enhancements use survey data for both industrial and domestic data. All code and data base enhancements are described in the Phase V Summary Report (Reference 5).

Phase VI further enhanced both the capabilities of the model and the data base. Interactive graphics were incorporated, the rationing procedure was improved, and groundwater use was explicitly accounted for. A new electric energy submodel was written to deal with water use by thermal plants, and to estimate hydro power generation from the simulated streamflows. Corresponding input information was added to the data base. Descriptions of the new features are to be found in the Phase VI Summary Report (Reference 6).

Phase VII included further development of the graphics capabilities, enhancements to the industrial water use and demand/price analysis routines, and a number of data processing improvements. Corresponding data base expansions were also carried out. Descriptions of the new features can be found in the Phase VII Summary Report.

2 - CONCEPT OF THE WATER USE ANALYSIS MODEL

2 - CONCEPT OF THE WATER USE ANALYSIS MODEL

The basic purpose of the model is to compare predicted water use requirements with the available supply to identify those basins and subbasins which have potential water shortages. The smallest element examined is the subbasin, typically a tributary or segment of a major river system, which has a stream 'gauge point' associated with it. The results of the subbasin analyses are aggregated to produce results by major river basin and by province or economic region. The ten provinces are used as the basic economic regions in the model. Depending on the needs of the user, other boundaries can be selected as the economic regions. Previous phases of the model used five regions defined by Statistics Canada (Statscan).

The model may be considered as equivalent to a 3-step process.

Step 1 - Subbasin Use Requirements

Water use requirements include both gross intake and consumptive use. Gross intake includes all water abstracted from the stream and groundwater system within the subbasin whether or not the water is returned to the subbasin. Consumptive use is that water which is abstracted from but is not returned to the subbasin. Data files are prepared by the user containing base year information and water use rates relating to population, livestock and industry. Forecast files are also prepared by the user for these categories describing the anticipated growth rates. Required base year and forecast data for irrigated agriculture covers crop, soil and irrigation type areas and properties, as well as operational factors affecting water use. Required minimum flows can be specified at the outlets from each subbasin to reflect water quality and other instream water use requirements within the subbasin.

Step 2 - Determine Water Availability

For each subbasin, a sequence of natural monthly hydrologic records is prepared and filed with the model. Groundwater supply and reservoir regulating details can be specified in data files.

Step 3 - Compare Water Use and Availability

For the demand forecast year selected by the user, the model determines the water intake and consumption requirements and compares these month by month against the simulated hydrologic record for each subbasin. Statistics relating the gross intake and consumption to water availability are produced.

These three steps are defined in more detail below.

2.1 - Water Intake and Consumption Requirements

Water use is determined within four basic categories: domestic, livestock, irrigation and industrial. The data required by the model to determine the water use by each of these four categories are discussed below.

2.1.1 - Domestic

Domestic water use in the model is expressed as liters per capita per day for both rural and urban populations. Within each of these two categories it is possible to define additional classifications of water use (such as residential, commercial, public, etc).

The water use data must be supplied by the user. Provincial data are available from the Canada Water Year Books produced by

Environment Canada (Reference 7). More accurate basin-specific data has been collected by the Inland Waters Directorate and has been incorporated into the data base in recent phases of the project. It is important that water for industrial use supplied through municipal distribution systems, be eliminated from reported municipal water use to give urban domestic water use. The model accounts for industrial water use separately.

Population data, split into rural and urban components, are available for each subbasin from Statscan, based on the 1981 census. These data are also supplied to the model by the user. Statscan can also provide forecast population growths by province under various development scenarios, which are apportioned to the subbasin on the basis of baseline population data.

The model uses the domestic water use rates and the forecasts of future population to establish the total domestic water requirement in each subbasin.

2.1.2 - Livestock

Total intake water requirements for livestock are expressed in liters per head per day, with consumption expressed as a percentage of the total intake. Water use rates per head must be obtained and supplied by the user on the basis of published data.

The base year livestock data are expressed as total number of head by livestock type. Forecasts of livestock development must be prepared by the user for each subbasin from documented forecasts or on the basis of past trends. Data are available from Statscan, based on the 1981 census.

The model uses the livestock water use rates and the forecasts of livestock development to compute the total livestock water requirements in the subbasin.

2.1.3 - Irrigation

Water use for irrigation is obtained from a consideration of irrigated areas under different crop types, taking into account soil type, irrigation type, precipitation, evapotranspiration, soil moisture levels and various operational factors. The basic calculations are performed in units of millimetres per hectare, on a monthly basis within the cropping season (as defined by the user), and for a historic period of years determined by the precipitation record.

Unlike other water uses, irrigation water use is evaluated on the basis of irrigation areas rather than subbasins. The user is required to specify the proportions of diversion and return flows supplied or received by the corresponding subbasins for each irrigation area.

Monthly values of precipitation and reference potential evapotranspiration are also to be provided. These data can be a full historic record or a statistically derived year of data. Various sets of precipitation and potential evapotranspiration data can be used by the model so that climatic variations within the overall basin can be allowed for.

General data required include crop, soil and irrigation type parameters. Data specific to each irrigation area, and to base and forecast year scenarios, include definition of crop, soil and irrigation types and their percentage areas, as well as total irrigated area and operational factors such as level of irrigation, application efficiency and delivery efficiency.

Sources of crop and irrigation data will vary from province to province, and some general data will probably need to be obtained from internationally recognized references. A selection of references may be found in the Phase III Summary Report (Reference 3).

Monthly irrigation diversion and return flow volumes are calculated by the irrigation water use submodel for each irrigation area, for combination with the other water uses on a subbasin basis.

2.1.4 - Industrial

Industrial water use is categorized into the 30 basic industrial sectors listed in Table 2.1. These basic sectors can be further subdivided to provide a better representation of water use (although this has not been done in the sample data in this manual). There are two parts to data specification for industrial water use.

The first set of data defines the distribution of industrial water usage in the region. This includes total annual water intake for the region, consumption percentage, and total value of shipments (in terms of 1981 dollars). The water intake and dollar data are used to calculate a 1981 'cost' of water that can be used in price elasticity analyses. The dollar data are also used to estimate the effect of inter- and intraregional cascading effects.

The second set of data defines industrial water intake at each node in the network. This includes total annual water intake and consumption percentage for each industrial sector.

To use the model, the user must supply (for each industrial sector)

- total annual water intake figures for each region
- total annual water intake figures for each node

TABLE 2.1

LIST OF INDUSTRIAL SECTORS

Number	Basic Sector
1	Agriculture*
2	Forestry
3	Metal mines
4	Mineral fuels
5	Nonmetal mines
6	Food and beverages
7	Tobacco
8	Rubber and plastics
9	Leather
10	Textiles
11	Wood
12	Furniture
13	Paper
14	Printing
15	Primary metals, iron
16	Primary metals, other
17	Metal fabricating
18	Machinery
19	Transportation equipment
20	Electrical products
21	Nonmetallic minerals
22	Petroleum and coal
23	Chemicals
24	Miscellaneous manufacturing
25	Construction
26	Transportation
27	Electric power*
28	Other utilities
29	Trade
30	Other

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*Although the agricultural sector is included in the list, all calculations for agricultural water use are done separately by the irrigation water use submodel and by analysis of livestock water requirements rather than on an economic basis. The purpose of including agriculture in the list of industrial sectors is to ensure any economic growth in agriculture is properly reflected in the growth of other sectors through application of the intraregional input/output matrices (see Reference 2). This also applies to the electric power sector, the water demands for which are handled by the electric energy submodel.

- base year value of shipments for each region
- forecast growth factors by region.

Note that the term 'region' implies 'province' for most applications; however, the model is flexible enough to accept other regions selected by the user.

In addition to the general industrial water use, the user may allow for specific energy developments. Their water requirements are then added to the general industrial water use amounts.

Water use by thermal power plants is modeled using an electric energy water use submodel. Information required for this sector includes individual plant characteristics and generation values. The requirements are added to the general industrial water use amounts.

The model incorporates industrial input/output matrices for each economic region in order to correctly maintain the backward and forward production linkages between various industries. Similarly, the interregional trade estimates for each sector, as produced by Statscan, have also been included. Therefore, the impact of growth in one sector in one economic region is reflected in the growth of that sector in another economic region.

2.2 - Other Water Use Requirements

In addition to the water intake and consumption requirements just mentioned, there are a number of other requirements which affect the disposition of water at each node.

2.2.1 - Diversions

A number of diversions can be specified for each node. These diversions can be either positive, i.e., extra water supply, or negative, i.e., extra consumption. In the model, these diversions are considered as part of the 'supply' to the node (even though they may be negative). That is, the diversion amount is always added to the other supplies to the node before any consumption calculations are considered.

By specifying diversions, one can simulate the transfer of water from one subbasin to another, or from or to the major basin under study. This enables the user to study the effects of a diversion on satisfying needs in water-short areas.

2.2.2 - Minimum Flows

In many subbasins, a minimum flow may be required to satisfy water quality or other instream uses. The model provides the user with the option of specifying this minimum flow at the outlet from the subbasin. The model computes the outflow considering subbasin inflows and consumptive uses. Months when the minimum flow constraint is violated are flagged in the output, and the frequency of occurrence is documented.

2.2.3 - Apportionment Flows

At provincial or national boundaries, minimum flows required by interjurisdictional agreements need to be met. These flows are specified by the user, and the model checks the simulated outflows for compliance with the requirements. If necessary, the model determines and applies cutbacks in water use to satisfy the apportionment flow requirements.

2.3 - Water Availability

There are several model components which define availability of water to meet water use requirements, as discussed below.

2.3.1 - Streamflows

Surface water availability is determined from a stream gauge corresponding to the outflow location of a subbasin. Monthly hydrologic data should be naturalized by removing the historic effects of regulation and water use.

2.3.2 - Groundwater

Provision has also been made in the model for including water availability from groundwater sources. This is expressed as a monthly decimal fraction of demanded intake for each water use at each node (except for thermal power plants, which are virtually never supplied from groundwater). The groundwater use is added directly to the supply at the node, subject to an optional limit on the total monthly groundwater withdrawal.

2.3.3 - Reservoirs

One reservoir may be associated with each node. For the purposes of the analysis, the reservoir is assumed to be located immediately downstream from the node. That is, all other water uses are considered at the node and its outflow passes directly to the reservoir as inflow (thereby implying that water use at the node takes precedence over reservoir operation). The inflow is assigned to storage or releases according to the reservoir operating rules. The algorithm for determining reservoir operation is detailed in the Phase V Summary Report (Reference 5).

2.3.4 - Off-Stream Storage

Off-stream storage effects can be allowed for in the case of irrigation areas, special energy projects and thermal power plants by specifying a redistribution of the corresponding intake requirements.

2.4 - Comparison of Water Supply and Demand

Water supply and demand are compared monthly over the period of available hydrologic record, by calculating the ratio of water demand to supply for each month. A frequency histogram of these ratios is produced, and the months with the most critical (highest) ratio of use to supply are identified.

Two types of water shortage can arise. One instance occurs when the consumption at a node exceeds the available supply. In this case, the nodal outflow is set to zero, return flows to other nodes (from irrigation areas and thermal power plants) are appropriately reduced, and the model proceeds to the next node in the network. The second instance occurs when a boundary apportionment flow requirement exceeds available supply. In this case a water rationing procedure is applied.

In setting up the model, the user specifies the hierarchic relationships of the subbasins, reservoirs and irrigation areas within a main basin. The model examines the upstream subbasins first, passing surplus water to the next subbasin downstream. Local subbasin inflows, groundwater supplies, irrigation and thermal plant return flows from other subbasins, diversions, and surplus flows from upstream are considered in computing water availability. In this way, the impacts of all upstream water sources and water uses are accounted for in analyzing downstream basins. Final results may be aggregated by subbasin, basin, province or economic region.

2.5 - Applications of the Model

The model has been designed to enable the user to ask a wide range of 'what if' questions relating multisectoral growth to the availability of water. The model can also be used to make a preliminary assessment of various remedial measures (such as diversions) which may be proposed to relieve areas with chronic water shortages. The following specific applications are observed.

(a) Primary application of the model was expected to be in the evaluation of water resource impacts of adding new, energy-related developments to specific river basins. The model has been designed for this type of site-specific evaluation, and guidelines to the water use rates for various forms of energy developments are presented in the Phase IV Summary Report (Reference 4).

(b) By changing the development forecasts, the impact of various growth scenarios on potential water shortage areas can be examined. The exogenous forecasts for each industrial sector are input by economic region. Therefore, the impact of industrial growth in one region can be studied in the light of its effect within the same region and, through the interregional input/output matrices, on the other economic regions in the country. Similarly, the effects of change in one industrial sector on other industrial sectors in the region can be studied using the intraregional input/output matrices.

(c) The impact of specific energy projects can be evaluated by locating them within specific subbasins in the model.

(d) Population, livestock and irrigation forecasts can be altered to examine their impact on overall water availability and, hence, on water available to industry.

(e) Changes in industrial water use due to either price or technological changes can be simulated.

(f) Interbasin transfers can be simulated with the model and therefore the impact of planned diversion schemes on water shortage problems can be judged.

(g) The impact of additional on-stream storage on water shortages can be judged.

(h) Studies have been, and will continue to be, conducted on medium- and long-term climatic changes in Canada and around the world. The impact of predicted climatological changes on crop irrigation water requirements, and hence on overall water resource utilization, can be readily evaluated with the model.

(i) The impact of changes within the irrigation sector in particular can be estimated in some detail. Alterations in cropping patterns, changes in irrigation methods, physical and operational improvements, area expansions, implementation of new irrigation projects and incorporation of new sources of supply, are all amenable to analysis with the model.

(j) The impact of changes in thermal plant water use can be identified.

(k) The effects of all water uses on hydro power generation can be determined, and scenarios involving various combinations of online hydro plants can be examined.

(l) The ability to comply with alternative minimum instream flow requirements, and with interjurisdictional flow requirements, can be assessed.

Some difficulty may be experienced in the analysis of small drainage basins where the number of decimal places displayed in the program outputs does not provide sufficient information to the user. In spite of this, the model is conceptually capable of analyzing basins of any size within the limitations of the data available.

3 - SYSTEM DESCRIPTION

3 - SYSTEM DESCRIPTION

3.1 - Hardware and Software

The program requires an IBM-PC with a minimum of 640K memory. A hard disk is necessary because of the volume of data used in the model. The program was written entirely in FORTRAN and compiled using the Ryan-McFarland FORTRAN compiler, version 2.4, for the IBM-PC. A 15-in. wide printer is required, capable of printing in compressed mode (16 characters/in.) to ensure that final program output will fit on the page.

Other FORTRAN compilers commonly available should produce a similar executable code in terms of size, execution time, etc.

3.2 - User Expertise

Loading and running the model can be performed in a routine manner. However, because of the large amount of different data that is included in the system, it would be difficult for an inexperienced user to generate useful results. The user must fully understand the manipulation of the various data files, the use of the IBM-PC's Disk Operating System to copy and print data files, and the use of an additional screen editor program to edit data files.

When originally designing the program, it was recognized that the amount of data processed would be substantial. An 'interactive' or 'user-friendly' program that would prompt the user for all required input would be too tedious for entering the data. The user must therefore develop an understanding of the file structure so that data changes can be made directly to the files.

The procedure for operating the program is defined in Appendix A.

3.3 - Constraints

Presently, the constraints on the WUAM are

- 10 economic regions
- 10 provinces
- 50 network nodes
- 3 nodes upstream from any particular node
- 20 nodes without any nodes further upstream
- 10 boundary nodes
- 5 reservoirs
- 3 urban water uses
- 3 rural water uses
- 10 livestock types
- 30 major industrial sectors
- 30 industrial subsectors
- 75 irrigation areas
- 21 irrigation areas associated with each network node (7 each for self-supply, upstream return and downstream supply)
- 3 supply nodes to each irrigation area
- 3 return nodes from each irrigation area
- 10 crop types
- 10 soil types
- 10 irrigation application types
- 30 thermal plants
- 5 cooling types
- 5 fuel types
- 5 condenser types
- 25 hydro plants
- 20 energy projects
- 15 energy projects (per scenario per node)
- 3 diversion amounts (per scenario per node)
- 3 minimum flows (per scenario per node)
- 5 hydrologic designations
- 100 years of hydrologic record and population data

- 12 periods (months) per year
- 15 points in stage/discharge curves
- 20 cutback increments
- 5 sets of industrial efficiency factors.

4 - MODEL STRUCTURE

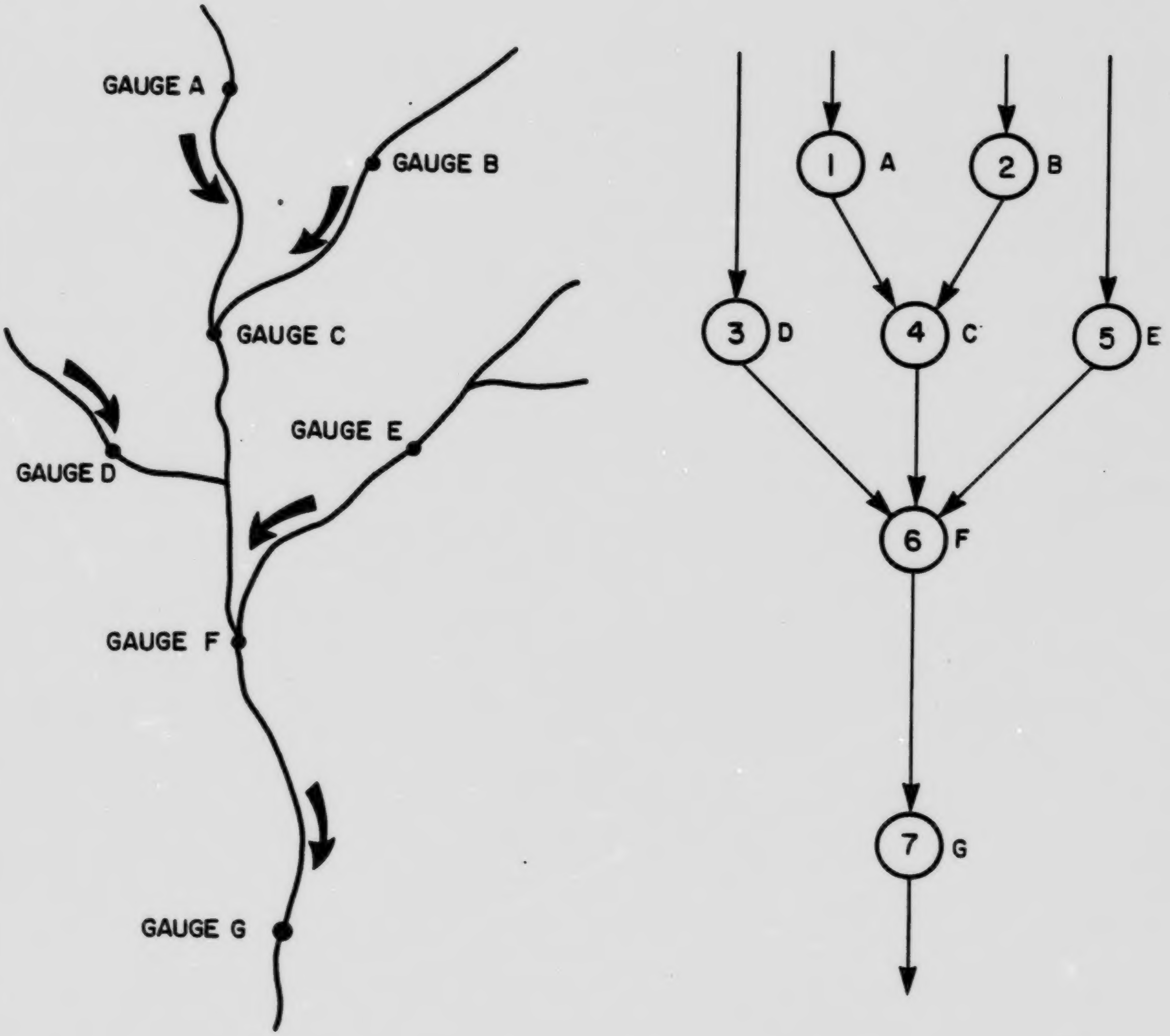
4 - MODEL STRUCTURE

4.1 - Overview

The goal of the model is to analyze the effect of future development scenarios on the water supply in a given basin. For the purposes of this model, a 'basin' can refer to any area being studied. A basin can, in turn, be broken down into a number of 'subbasins.' The only constraint on the delineation of the subbasins is that a monthly record of streamflow must be provided at the subbasin outlet. For this reason, the subbasins are generally defined as the drainage areas above certain hydrologic gauges. Using operations research terminology, the 'basin' is called the 'network' and the 'subbasins' or 'gauges' are 'nodes' in the network. However, a network may represent either an individual hydrologic basin or a number of independent basins as demonstrated in Figures 4.1 and 4.2.

At each node in the network, the model calculates the difference between the water available and the projected water uses. Water is available from six sources:

- outflow from upstream nodes (calculated by the model)
- local supply (from historical data)
- groundwater supply
- return flow from irrigation areas supplied from upstream nodes (calculated by the model)
- return flow from thermal plants supplied from upstream nodes (calculated by the model)
- other supplies, such as incoming diversions (defined by the user).

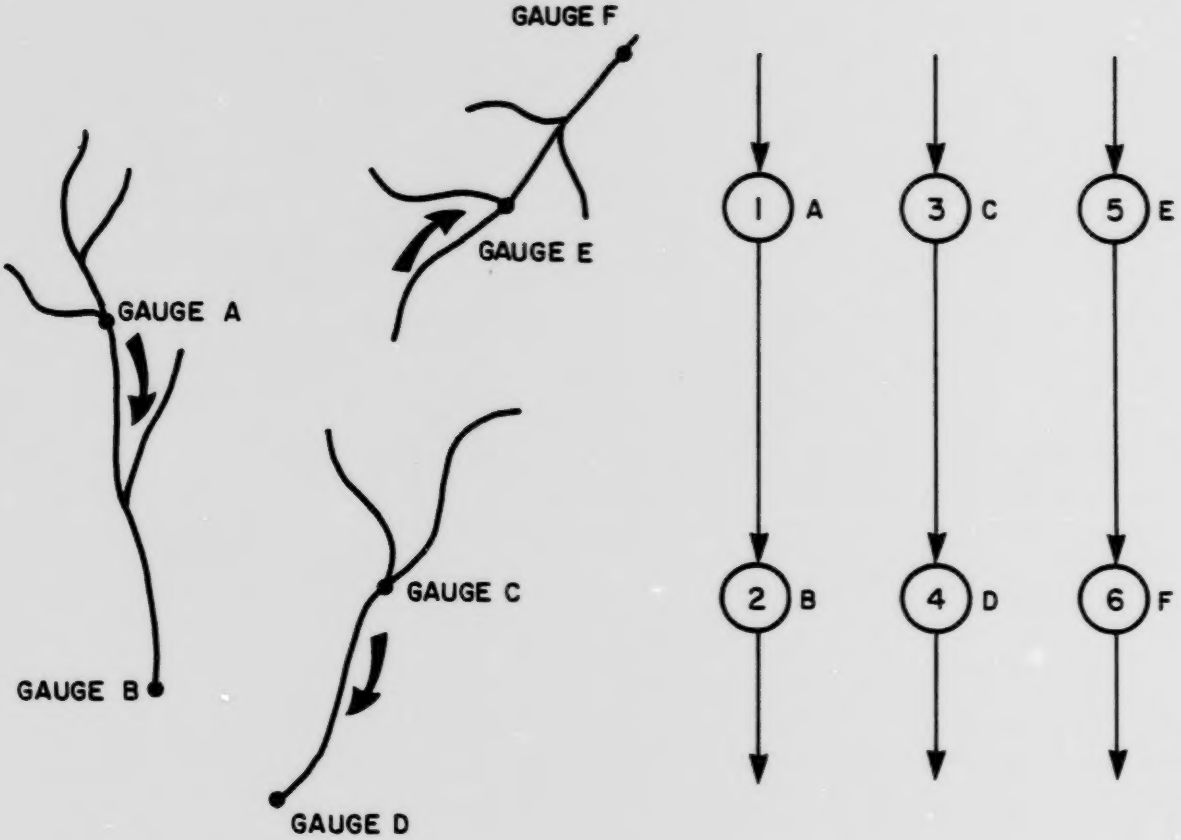

GAUGE A
GAUGE B
GAUGE C
GAUGE D
GAUGE E
GAUGE F
GAUGE G
1 A
2 B
3 D
4 C
5 E
6 F
7 G

TOPOGRAPHY

NETWORK

FIG. 4.1

ILLUSTRATION OF A NETWORK
REPRESENTING A SINGLE HYDROLOGIC BASIN


GAUGE F
GAUGE E
GAUGE A
GAUGE B
GAUGE C
GAUGE D
1
A
3
C
5
E
2
B
4
D
6
F

TOPOGRAPHY

NETWORK

FIG. 4.2

ILLUSTRATION OF A NETWORK
REPRESENTING A NUMBER OF INDEPENDENT HYDROLOGIC BASINS

There are four basic water uses

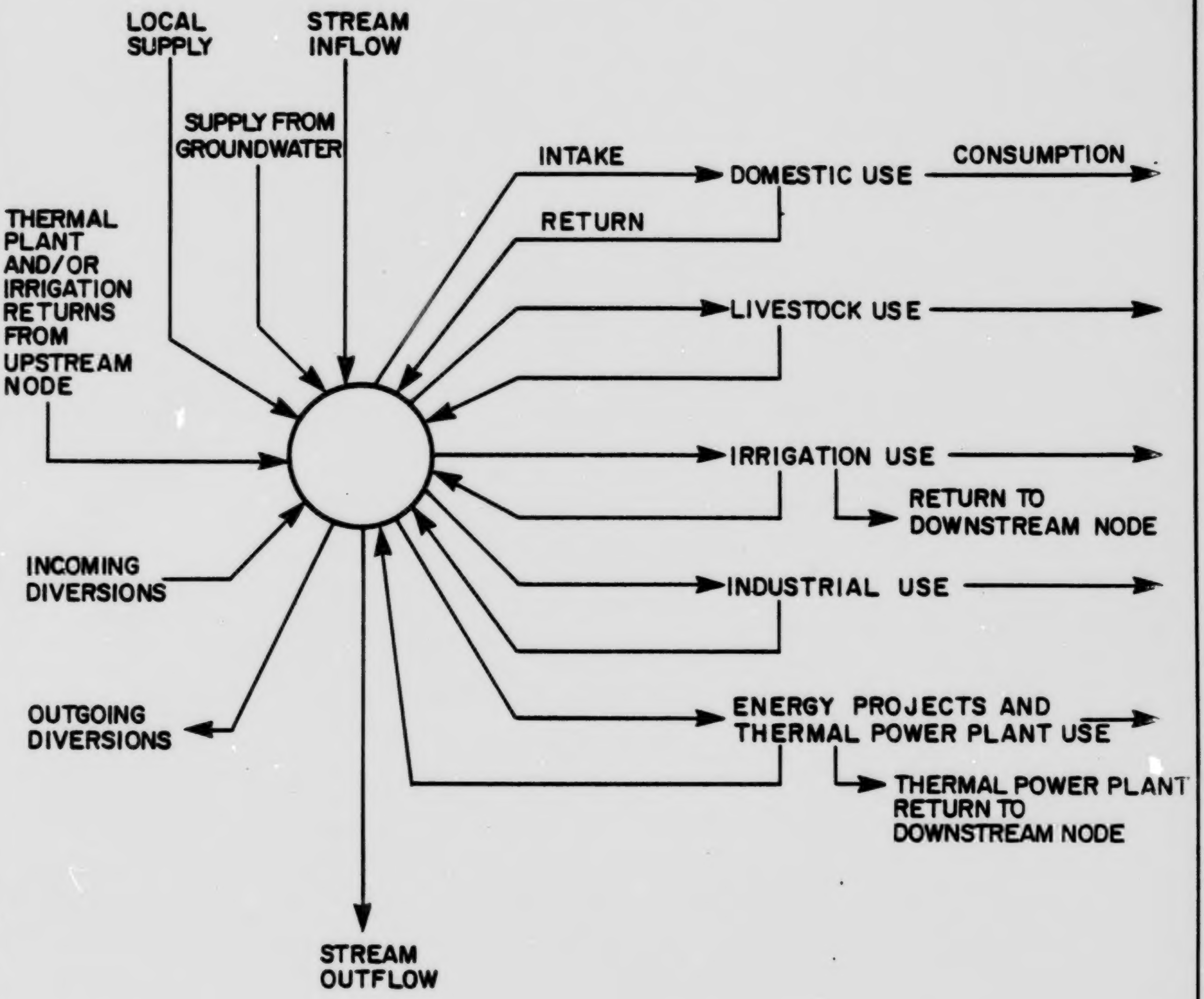
- domestic (based on population)
- livestock (based on number of animals)
- irrigation (based on detailed crop and irrigation system calculations)
- industrial (based on defined intake amounts), including specific energy projects and thermal power plants considered separately.

In addition, there may be an outgoing diversion defined by the user for the node.

Both intake (the total amount of water withdrawn from the sources) and consumption (that part of intake which is not returned to the network) are computed.

The model compares the difference between the water available and the water used at each node, and it calculates the net outflow from the node. The calculation process is illustrated in Figure 4.3. At this point, if a reservoir is being modeled at the node, the outflow is adjusted to reflect application of the specified reservoir operating rules. Once the outflow from the subbasin is determined, the model compares it with a user-defined minimum flow constraint to determine if the constraint has been violated.

One other constraint that the model considers is the flow requirement at jurisdictional boundaries. The model automatically defines a 'boundary' node as one that connects to a downstream node with a different province number.


LOCAL SUPPLY
STREAM INFLOW
SUPPLY FROM GROUNDWATER
THERMAL PLANT AND/OR IRRIGATION RETURNS FROM UPSTREAM NODE
INTAKE
RETURN
DOMESTIC USE
CONSUMPTION
LIVESTOCK USE
IRRIGATION USE
RETURN TO DOWNSTREAM NODE
INCOMING DIVERSIONS
INDUSTRIAL USE
OUTGOING DIVERSIONS
ENERGY PROJECTS AND THERMAL POWER PLANT USE
THERMAL POWER PLANT RETURN TO DOWNSTREAM NODE
STREAM OUTFLOW

$$\text{NET INFLOW} = \text{LOCAL SUPPLY} + \text{STREAM INFLOW} + \text{GROUNDWATER} + \text{DIVERSIONS IN} - \text{DIVERSIONS OUT} + \text{IRRIGATION AND THERMAL PLANT RETURNS FROM UPSTREAM}$$

$$\text{OUTFLOW} = \text{NET INFLOW} - \sum^{\text{ALL USES}} (\text{INTAKE} - \text{RETURN}) \text{ AT THE NODE}$$

FIG. 4.3

CALCULATION DETAIL AT EACH NODE

For these boundary nodes, the user must define the flow to be passed across the boundary. If this flow cannot be met in a particular month, the model will

- first, attempt to meet the shortage by drawing down reservoirs in the upstream province network to their lower rule curve

- second, satisfy the remaining shortage by cutting back consumption as required in the upstream province network. (The four usage categories are cut alternately, by the increments, and in the order, specified by the user.)

It should be noted that if a boundary shortage is identified, the model checks to see if the province upstream of the boundary node is consuming more water than that to which it is entitled. If not, it is assumed that the rest is going into beneficial storage, and no remedial measures are taken.

It should also be noted that cutbacks must be applied to real consumption, not to total consumption at a node, since this may include an apparent consumption. Real consumption at a node is that portion of intake which is physically consumed. Apparent consumption at the node is that portion of intake which is returned to another node of the network, as can occur in the case of modeled irrigation areas and thermal power plants.

Water going into off-stream storage is considered to be real consumption, and therefore subject to cutbacks. However, cutbacks cannot be applied to diversions, nor to water supplied from groundwater sources or from off-stream storage (i.e., water can be prevented from going into off-stream storage if it is needed elsewhere, but it cannot be prevented from being released or directed to another use once it has been stored).

The overall output from the model is a historical comparison of the percentage of gross water available that is used as either 'intake' or 'consumption.' The user must still assess the impact of such trends.

4.2 - Irrigation Areas and Thermal Power Plants

The calculation of irrigation requirements is done on the basis of irrigation areas. The irrigation areas must be linked to the network, as illustrated in Figure 4.4. The user must define the percentage of the total flow to be attributed to each supply and return flow.

A thermal power plant is supplied entirely from one node and discharges to a single node, but these two nodes can be different nodes, the former one upstream from the latter one.

4.3 - Data Files

The model is largely a file-handling system, and the program provides tremendous flexibility in arranging the various files. Since the model is so data intensive, it demands that each analysis be done in a careful and methodical manner.

There are 33 types of data files used in the model. Twenty-two of them must be created by the user (using a separate screen editor program of the user's choice*). Note that the subdirectory location of each file is important, as described in Appendix A. All files are in text

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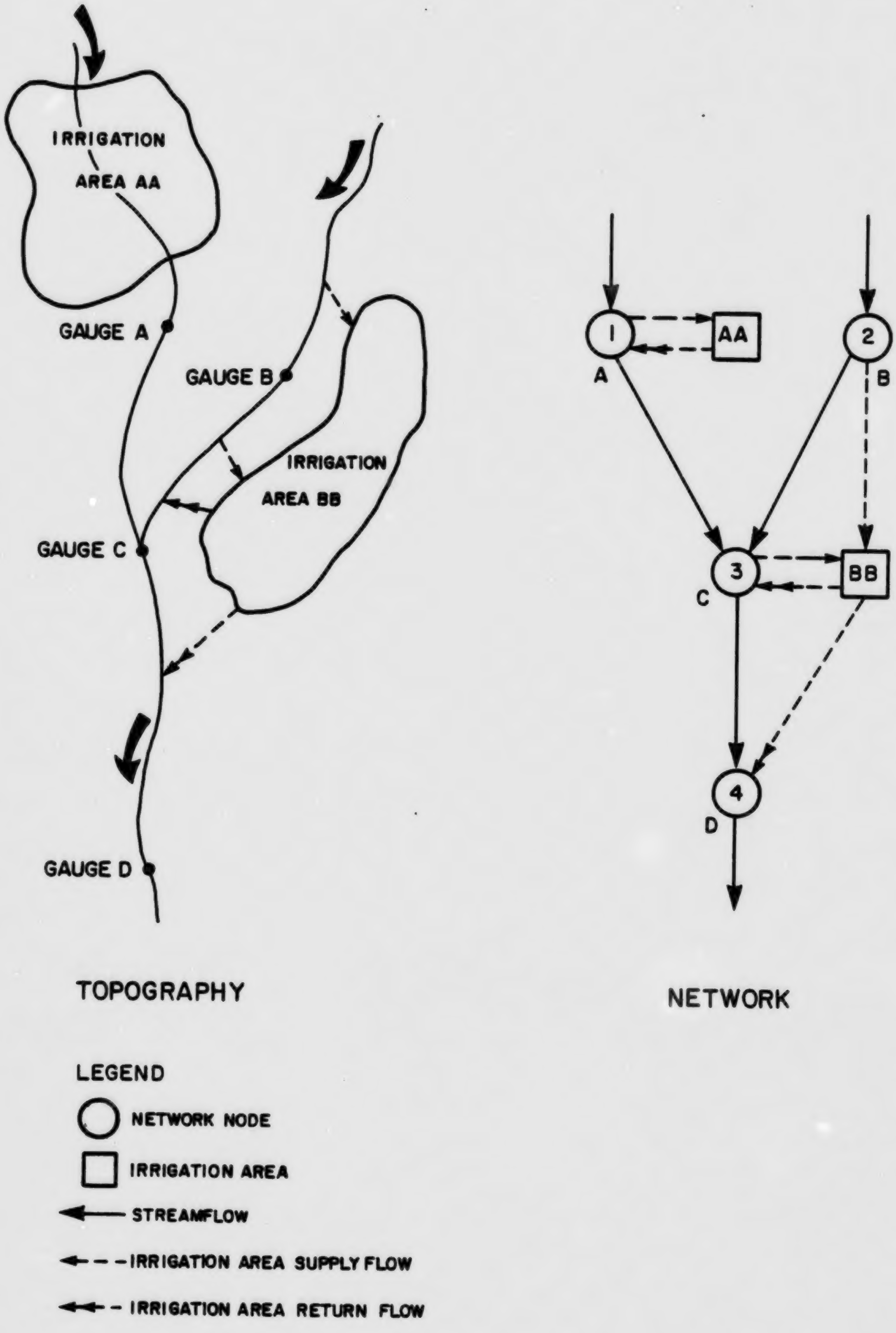
*The screen editor used in the development of this model was purchased as a separate software package along with the hardware. Instructions for the use of editors are provided by the specific software vendor and it is the user's responsibility to become conversant with his editor. No additional instructions are provided in the manual on the use of an editor.


IRRIGATION
AREA AA
GAUGE A
GAUGE B
IRRIGATION
AREA BB
GAUGE C
GAUGE D
1
AA
A
2
B
3
BB
C
4
D
LEGEND
NETWORK NODE
IRRIGATION AREA
STREAMFLOW
IRRIGATION AREA SUPPLY FLOW
IRRIGATION AREA RETURN FLOW

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NETWORK

FIG. 4.4

ILLUSTRATION OF A NETWORK INCLUDING IRRIGATION AREAS format, which means that they can be edited, printed, or communicated to another computer.

All data are read by the program as 'free-field' input; that is, input items do not have to be in a predefined format. Input may be spread out along one line or even over a number of lines. Only the total number of items is important. However, each item must be separated from another by at least one space or a comma. Names must be enclosed in single quotes. Zero values must be specified the same as any other; the field cannot be left blank. It may appear that the sample data files provided later in this manual are 'formatted' (i.e., the values appear to line up when the file is listed). This is done for clarity in editing and is not necessary for correct operation of the program; however, the 'formatting' of data files in this way is strongly recommended.

One cautionary note about free-field formats: if there are not enough data items on one line, a READ command will automatically look to the next line, but if a line contains more numbers than are required by the READ, the extras are ignored, and a new line is read by the next READ statement. Therefore, there should not be too many data items on a single line. In general, a new line should be started any time there is a space in the input description, any time data is being repeated (e.g., for each month, for each province, etc), any time it makes sense to do so, and any time there is doubt.

A feature of the data files is the provision of 'dummy' description fields at some points in the data file. These descriptions are read by the program (i.e., they must be included in the data file); however, they are not checked or retained by the program. The description is there only to aid in editing the file. For example, various pieces of data must be input by province. The ordering arrangement is defined in the general data base file. In this manual, the order is defined from west to east (e.g., 1 for British Columbia, 2 for Alberta, etc). To aid in editing some files, the province name in a 'dummy' field must be included. However, the user must be certain of the order defined in the general data base since that is the order in which the data will be stored by the program.

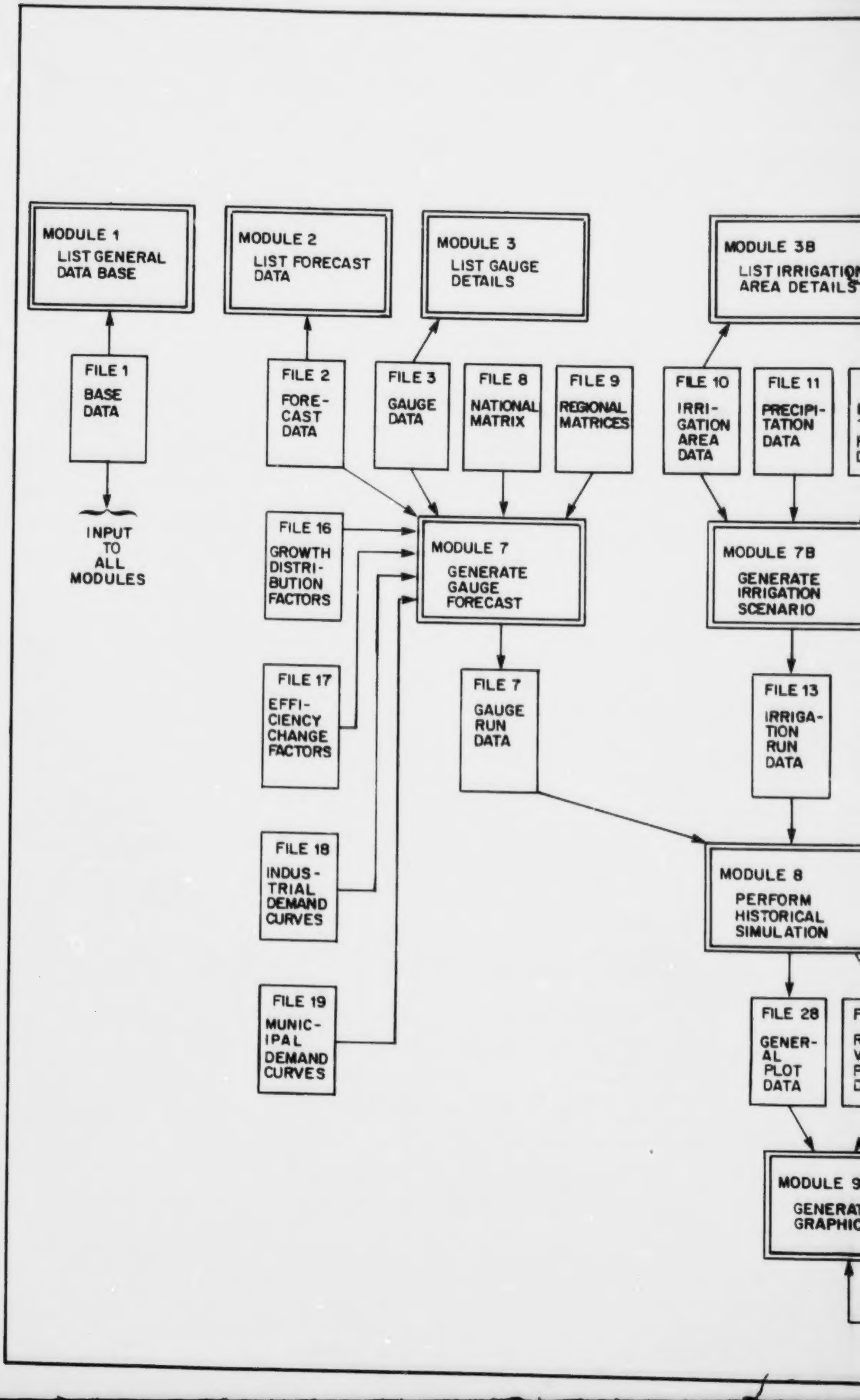
To ensure that the data are input properly, there are options in the program to allow printout of the values. Thus, the data file can be listed (using DOS utilities) in text form and compared with the 'list' produced by the program. This procedure is illustrated in Appendix B, and may be referred to once the user is familiar with the details of each data file.

The user can add an unlimited number of identification lines to the end of a data file to document the nature and source of the data. Relevant information might include the data reference, date of acquisition, process used for data preparation, etc. The use of this feature is recommended to allow the user to maintain a record of the information stored in each file.

The structure of the model and data files is presented in Figure 4.5 and a summary of the various data files is listed in Table 4.1. Further details of the files are presented in the following subsections, and in Appendix C. Samples of data files that are created by the user are listed in their entirety in Appendix C, while only selected sections of the other sample files have been included.

4.3.1 - General Data Base File

One file is created, labeled DATABASE.DAT, which contains all the basic information needed by the program. It defines the order in which data items must be entered in other data files and is read by all modules of the program. Once other data files have been created, any change in the order of items in this file would generate data inconsistencies in all the other files. Specific values can be changed in this file without errors, but the ORDER and NUMBER of items must remain constant.


MODULE 1
LIST GENERAL DATA BASE
MODULE 2
LIST FORECAST DATA
MODULE 3
LIST GAUGE DETAILS
MODULE 3B
LIST IRRIGATIO
AREA DETAILS
FILE 1
BASE DATA
INPUT TO ALL MODULES
FILE 2
FORE-CAST DATA
FILE 3
GAUGE DATA
FILE 8
NATIONAL MATRIX
FILE 9
REGIONAL MATRICES
FILE 10
IRRI-GATION AREA DATA
FILE 11
PRECIPI-TATION DATA
FILE 16
GROWTH DISTRI-BUTION FACTORS
MODULE 7
GENERATE GAUGE FORECAST
MODULE 7B
GENERATE IRRIGATION SCENARIO
FILE 17
EFFI-CIENCY CHANGE FACTORS
FILE 7
GAUGE RUN DATA
FILE 13
IRRIGA-TION RUN DATA
FILE 18
INDUS-TRIAL DEMAND CURVES
MODULE 8
PERFORM HISTORICAL SIMULATION
FILE 19
MUNIC-IPAL DEMAND CURVES
FILE 28
GENER-AL PLOT DATA
MODULE 9
GENERAT
GRAPHIC

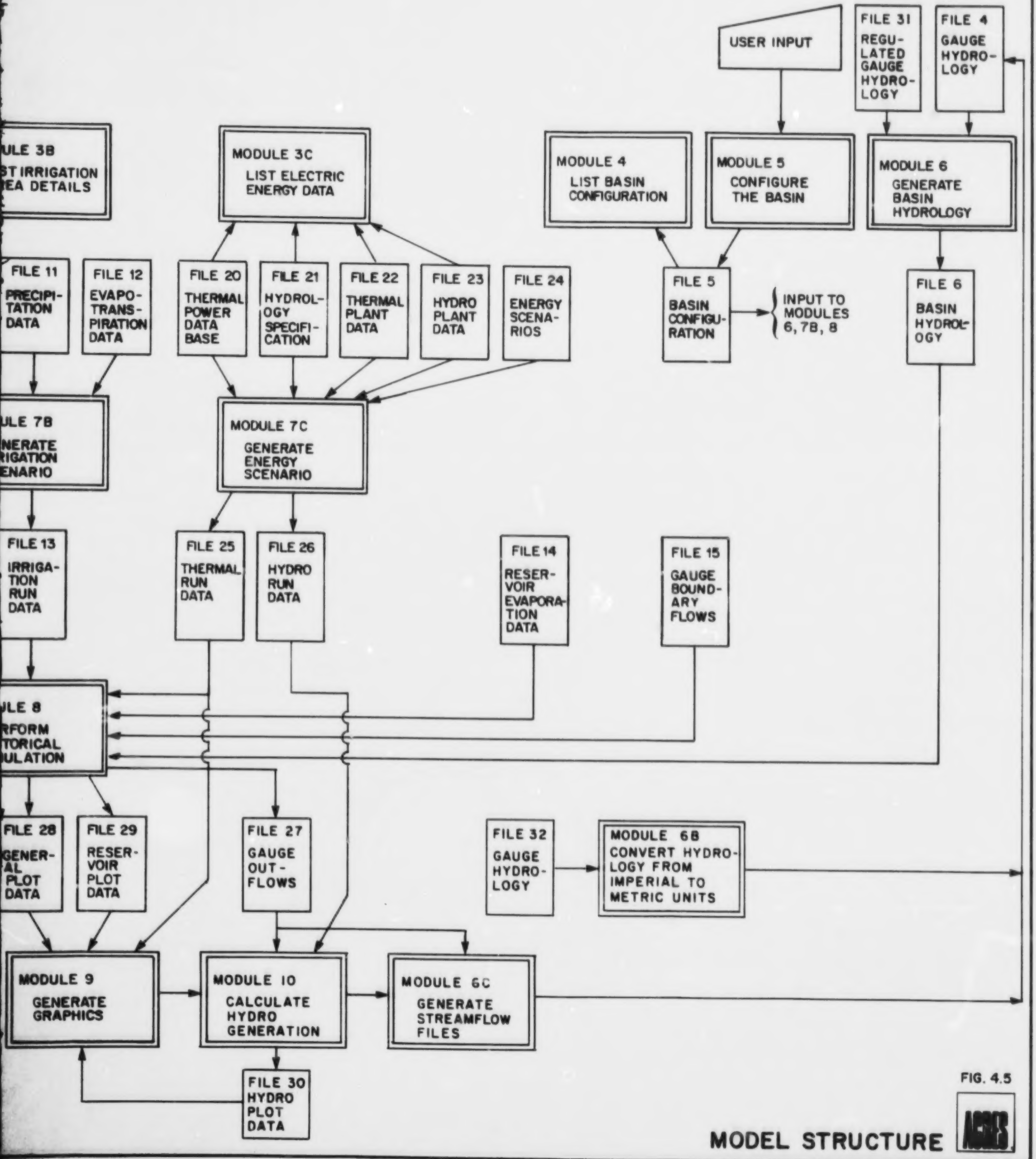

USER INPUT
FILE 31 REGULATED GAUGE HYDROLOGY
FILE 4 GAUGE HYDROLOGY
ULE 3B
ST IRRIGATION
EA DETAILS
MODULE 3C LIST ELECTRIC ENERGY DATA
MODULE 4 LIST BASIN CONFIGURATION
MODULE 5 CONFIGURE THE BASIN
MODULE 6 GENERATE BASIN HYDROLOGY
FILE 11 PRECIPITATION DATA
FILE 12 EVAPOTRANSPIRATION DATA
FILE 20 THERMAL POWER DATA BASE
FILE 21 HYDROLOGY SPECIFICATION
FILE 22 THERMAL PLANT DATA
FILE 23 HYDRO PLANT DATA
FILE 24 ENERGY SCENARIOS
FILE 5 BASIN CONFIGURATION
INPUT TO MODULES 6, 7B, 8
FILE 6 BASIN HYDROLOGY
ULE 7B
NERATE
RIGATION
ENARIO
MODULE 7C GENERATE ENERGY SCENARIO
FILE 13 IRRIGATION RUN DATA
FILE 25 THERMAL RUN DATA
FILE 26 HYDRO RUN DATA
FILE 14 RESERVOIR EVAPORATION DATA
FILE 15 GAUGE BOUNDARY FLOWS
ULE 8
RFORM
TORICAL
ULATION
FILE 28 GENER-
AL
PLOT DATA
FILE 29 RESERVOIR PLOT DATA
FILE 27 GAUGE OUTFLOWS
FILE 32 GAUGE HYDROLOGY
MODULE 6B CONVERT HYDROLOGY FROM IMPERIAL TO METRIC UNITS
MODULE 9 GENERATE GRAPHICS
MODULE 10 CALCULATE HYDRO GENERATION
MODULE 6C GENERATE STREAMFLOW FILES
FILE 30 HYDRO PLOT DATA

FIG. 4.5

MODEL STRUCTURE

TABLE 4.1

SUMMARY OF DATA FILES

Data File	Created by	File Name*	Extension	Access by Program Modules
1. General data base	user	DATABASE	.DAT	all - for storage in memory 1 - to list data to printer
2. Forecast data	user	FORECAST	.DAT	2 - to list contents to printer 7 - to generate gauge forecasts
3. Gauge data	user	G + user's choice	.DAT	3 - to list contents to printer 7 - to generate gauge forecast
4. Gauge hydrology	user	H + gauge ID	.DAT	6 - to consolidate all hydrology for the basin
5. Basin configuration	Program MODULE 5	BASIN	.DAT	4 - to list contents to printer 6 - to consolidate all hydrology for the basin 7B - to identify irrigation area precipitation and evapotranspiration data 8 - to provide linkages between irrigation areas and basin network for calculations over historical period
6. Basin hydrology	Program MODULE 6	BASIN	.HYD	8 - to provide streamflow data for calculations over historical period
7. Gauge run data	Program MODULE 7	same as File 3	.RUN	8 - to provide gauge water uses for calculations over historical period
8. Intraregional	user	region name**	.I-O	7 - to cascade industrial growths within regions
9. Interregional	user	NATIONAL	.I-O	7 - to cascade industrial growths between regions
10. Irrigation area data	user	I + user's choice	.DAT	3B - to list contents to printer 7B - to generate an irrigation scenario
11. Precipitation data	user	P + user's choice	.DAT	7B - to calculate irrigation requirements
12. Evapotranspiration data	user	E + user's choice	.DAT	7B - to calculate irrigation requirements

---

*Limited to 8 alphanumeric characters. Any user's choice is limited to 7 characters.

**Provinces or other economic region.

Table 4.1

Summary of Data Files - 2

Data File	**Created by**	**File Name***	**Extension**	**Access by Program Modules**
13. Irrigation run data	Program MODULE 7B	same as File 10	.RUN	8 - to provide irrigation water uses for calculations over historical period
14. Reservoir evaporation	user	E + gauge ID	.DAT	8 - to provide reservoir evaporation data over historical period
15. Gauge boundary flows	user	B + gauge ID	.DAT	8 - to provide boundary flow data over historical period
16. Growth distribution factors	user	DFACTORS	.DAT	7 - to appropriate industrial growth to various nodes
17. Efficiency change factors	user	EFACTORS	.DAT	7 - to account for potential technological change
18. Industrial demand curves	user	region name	.SSS	7 - to investigate the effect of price changes on industrial water intake
19. Domestic demand curves	user	PROVINCE	.SSS	7 - to investigate the effect of price changes on domestic water intake
20. Thermal power data base	user	TPOWERDB	.DAT	3C - to list controls to printer 7C - to generate thermal water use scenario
21. Hydrology specification	user	HYDROLOGY	.DAT	3C - to list contents to printer 7C - to generate thermal water use scenario
22. List of all thermal plants	user	THERMAL	.DAT	3C - to list contents to printer 7C - to generate thermal water use scenario
23. List of all hydro stations	user	HYDRO	.DAT	3C - to list contents to printer 7C - to create hydro generation scenario
24. Power plant scenarios	user	POWER	.DAT	7C - to specify thermal and hydro plants on-line in any given scenario
25. Thermal plants	Program MODULE 7C	THERMAL	.RUN	8 - to provide thermal plant water use over historical period

---

*Limited to 8 alphanumeric characters. Any user's choice is limited to 7 characters.

Table 4.1
Summary of Data Files - 3

Data File	Created by	File Name[*]	Extension	Access by Program Modules
26. Hydro plants	Program MODULE 7C	HYDRO	.RUN	10 - to calculate hydro generation
27. Nodal outflows	Program MODULE 8	OUTFLOWS	.DAT	10 - to calculate hydro generation
28. General plot data	Program MODULE 8	PLOTTER	.SUM	9 - to generate graphics
29. Reservoir plot data	Program MODULE 8	PLOTTER	.RES	9 - to generate graphics
30. Hydro plot data	Program MODULE 10	PLOTTER	.HYD	9 - to generate graphics
31. Regulated gauge hydrology	user	R + gauge ID	.DAT	6 - to consolidate all hydrology for the basin
32. Simulated gauge hydrology	Program MODULE 6C	H + gauge ID	.DAT	6 - to consolidate all hydrology for a different basin
33. Imperial gauge hydrology	user	H + gauge ID	.CFS	6C - to convert to metric units

---

[*] Limited to 8 alphanumeric characters. Any user's choice is limited to 7 characters.

The file must be created by the user. The required data contents are defined in Appendix C-1.

This data is common to all program modules and is stored in memory at all times.

4.3.2 - Forecast File

This file contains the various growth scenarios to be examined. There is no limit on the number of different scenarios of each type (population, livestock and industry, but not power plants or irrigation) defined in the file. At run time, the model will request that one of the growth scenarios of each type be chosen for that particular run.

It is recommended that all alternative growth scenarios be included in the file when it is initially created rather than changing the file for each run. This will minimize the potential confusion caused by changing the file without proper documentation and then comparing two runs which are not compatible in terms of their growth scenarios.

This file must have the file name FORECAST.DAT.

The file must be created by the user. The required data contents are defined in Appendix C-2.

4.3.3 - Gauge Data File

This file contains all the data describing the specific features of a subbasin (including population, livestock, and industry, but excluding power plants and irrigation). The user must ensure that all the values refer to the same data base year that is put into the DATABASE.DAT file. Additionally, much of the data specified in the data base file may be overridden. If specific data are available, they should be entered. Otherwise, enter a negative value ('-99') to indicate that the model should use the appropriate value (for the province or region) from the data base file.

The file name must consist of the letter 'G', the 7-character (maximum) gauge identifier, and the extension '.DAT' (e.g., G05CC002.DAT). For convenience, the examples illustrated in this manual use the Water Survey of Canada (WSC) gauge number as the gauge identifier.

The file must be created by the user and there must be one file for each 'gauge' or 'node' in the network. The required data contents are defined in Appendix C-3.

4.3.4 - Gauge Hydrology File

This file contains the natural historic streamflow data, by month, for the gauge. There is no specific option in the program to list this data; however, it may be printed using DOS commands (see Appendix B) and should be checked manually to ensure that it is correct.

The file name must consist of the letter 'H', the 7-character (maximum) gauge identifier, and the extension '.DAT' (e.g., H05CC002.DAT).

The file must be created by the user and there must be one file for each 'gauge' or 'node' in the network. The required data contents are defined in Appendix C-4.

4.3.5 - Basin Configuration File

This file describes the configuration of the network and is created by the program in response to user input. This is the only interactive data input module in the model. It contains the identification of the various nodes in the network and the manner in which they are connected. It also identifies the irrigation areas in the basin, and how they are connected to the network.

The file name must be BASIN.DAT.

Presently, there are five restrictions placed on the configuration of a basin.

(i) The total number of nodes in the network cannot exceed 50.

(ii) The total number of irrigation areas linked to the network cannot exceed 75.

(iii) The maximum number of nodes directly upstream from a particular node is 3.

(iv) An irrigation area may have a maximum of 3 supply nodes and 3 return nodes.

(v) Each node may have only 1 downstream node (i.e., the calculated outflow from a particular node cannot be routed to more than one node).

The first four restrictions can easily be expanded, subject to available memory space. The fifth restriction would be more difficult to alter, since it would demand additional data describing the proportion of the outflow destined for each downstream node.

Before configuring a basin in the program, the network should be laid out on paper. All upstream nodes must be defined (i.e., numbered) before the downstream nodes. It is helpful to draw the network as a hierarchical chart, and to initially number the nodes sequentially (starting with 1) from left to right at each level. The nodes at the top level will not have any upstream nodes; nodes at the bottom level will not have any downstream nodes.

A sample configuration was shown in Figure 4.1. In fact, there are a number of arrangements of the same network that would also be valid, as illustrated in Figure 4.6. They all satisfy the rule that all nodes upstream from a particular node have a lower number than the node itself.

When irrigation areas are added and linked to the network, it must further be ensured that all flows from a given area return to nodes with numbers which are equal to or higher than the numbers of all the nodes which supply flow to the area. This restriction is necessary because the model performs water balance calculations at the nodes in ascending numerical order. Before a water balance calculation can be performed at any node, all the return flows to that node from irrigation areas must have been previously established.

For example, if three irrigation areas were added and linked to the network of Figure 4.1, the node numbering arrangement would need to be changed, as shown in Figure 4.7. As mentioned previously, the network should be laid out on paper before it is numbered. The addition of irrigation areas introduces additional hierarchies into the network.

When reservoirs and boundaries are introduced into a network, further constraints must be considered. A reservoir is always associated with a node and is assumed to be immediately downstream of the node. If this assumption is not correct, then the user should add a 'dummy' node to the network (see Figure 4.8). This dummy node would have no water intake (zero population, no livestock, no industry, no irrigation). However, it would

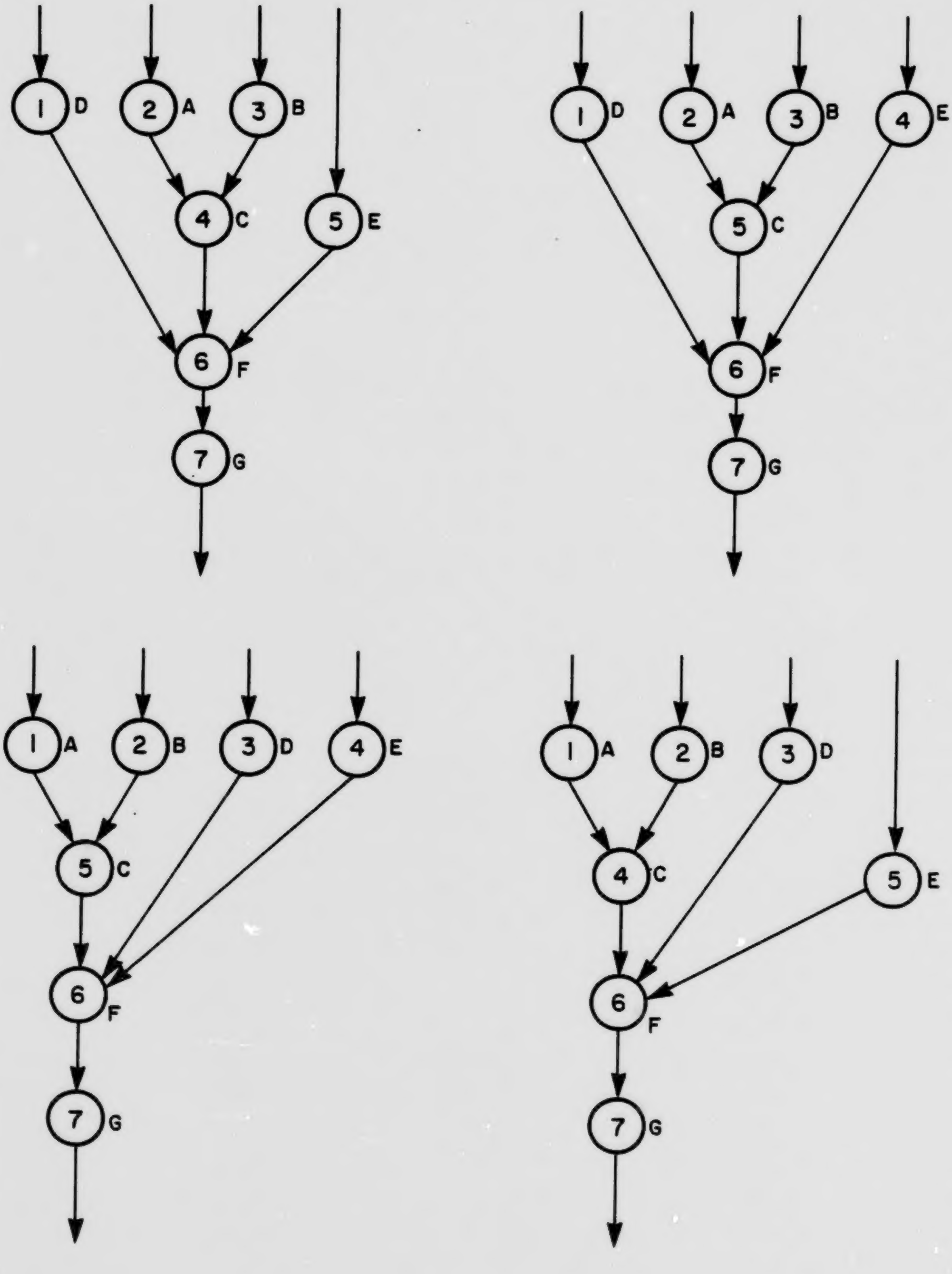
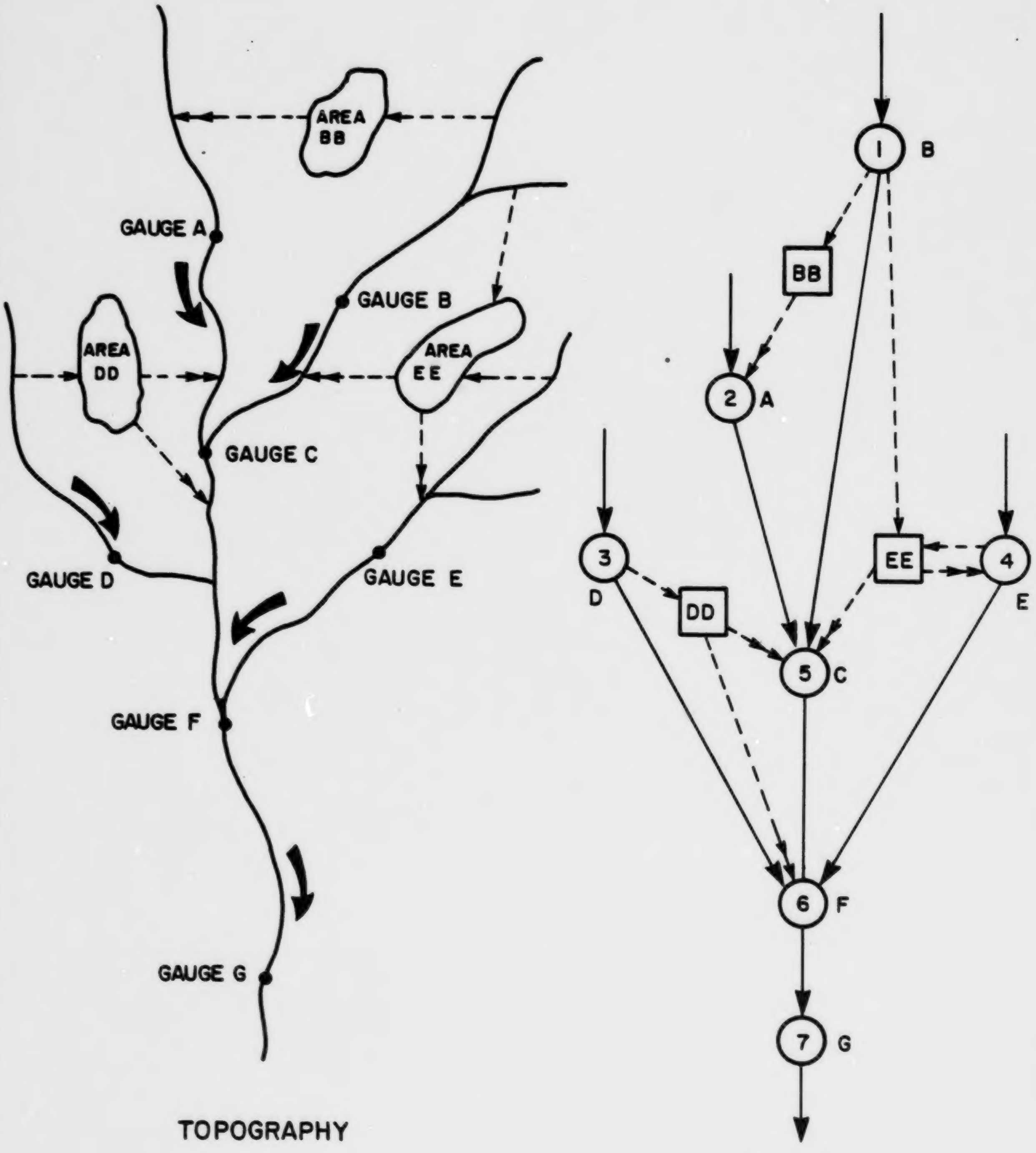

1 D
2 A
3 B
4 C
5 E
6 F
7 G
1 D
2 A
3 B
4 E
5 C
6 F
7 G
1 A
2 B
3 D
4 E
5 C
6 F
7 G
1 A
2 B
3 D
4 C
5 E
6 F
7 G

FIG. 4.6

ALTERNATE NUMBERING SCHEMES FOR THE SAME NETWORK


AREA BB
GAUGE A
GAUGE B
AREA DD
AREA EE
GAUGE C
GAUGE D
GAUGE E
GAUGE F
GAUGE G
1
B
BB
2
A
3
D
DD
EE
4
E
5
C
6
F
7
G

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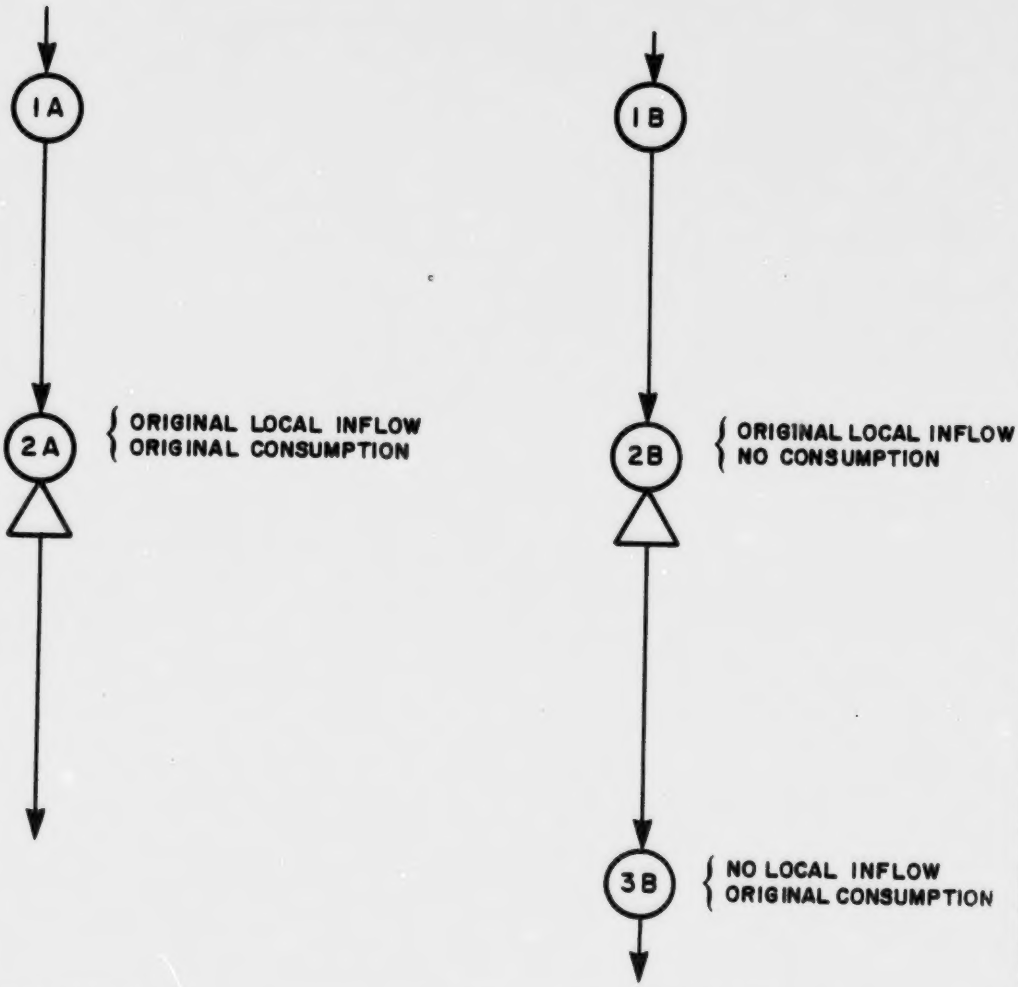
NETWORK

FIG. 4.7

NETWORK NUMBERING SCHEME WITH IRRIGATION AREAS


1A
2A
ORIGINAL LOCAL INFLOW
ORIGINAL CONSUMPTION
1B
2B
ORIGINAL LOCAL INFLOW
NO CONSUMPTION
3B
NO LOCAL INFLOW
ORIGINAL CONSUMPTION

NORMAL ASSUMPTION
OF RESERVOIR PLACEMENT

METHOD TO REPRESENT A
RESERVOIR IMMEDIATELY
UPSTREAM OF A NODE

FIG. 4.8

ADDITION OF
DUMMY NODES TO A NETWORK TO ACCOMMODATE RESERVOIRS

contain the reservoir information. Both nodes would have identical streamflow files (so that the local inflow to the second node would be zero). When boundary considerations exist in a network, the user must ensure that

- returns from irrigation areas do not cross a boundary, nor are they returned to any watercourse that crosses a boundary in a different location than the watercourse(s) from which the water was taken

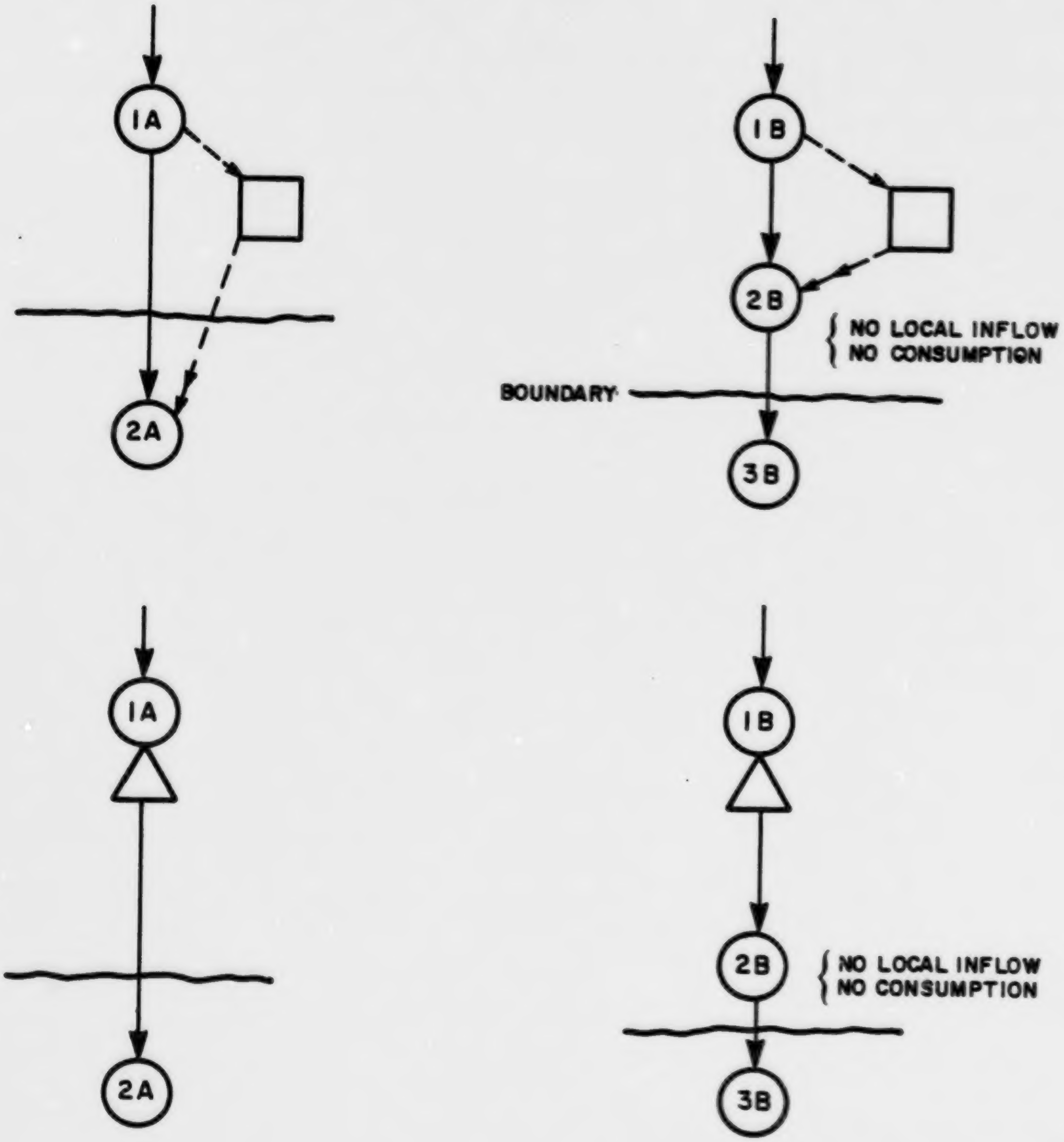
- nodes with reservoirs are not boundary nodes.

In neither case will the model signal an error condition; the results will simply be incorrect. For the correct analysis of these situations, the user must add a 'dummy' boundary node that has no local inflow and no consumption (see Figure 4.9).

The final consideration that the user has to make involves the case in which there are reservoirs in an area that eventually cross a boundary. In such a situation, the model arbitrarily assigns a 'search order' to the reservoirs that it will follow in an attempt to meet a boundary constraint shortage (since it will draw each reservoir, in that order, down to its lower rule curve in an attempt to meet the shortage).

This order is defined as the reverse order to that by which their nodes were numbered in the basin. Therefore, the user must ensure that the reservoir to be drawn down first should have the highest node number (relative to the other nodes with reservoirs).

Data contents of the basin configuration file are defined in Appendix C-5.



1A
2A
1B
2B
NO LOCAL INFLOW
NO CONSUMPTION
BOUNDARY
3B
1A
2A
1B
2B
NO LOCAL INFLOW
NO CONSUMPTION
3B

INCORRECT

CORRECT

FIG. 4.9

ADDITION OF DUMMY
NODES TO PROPERLY REPRESENT BOUNDARY CONDITIONS

4.3.6 - Basin Hydrology File

The program creates one basin hydrology file for each 'basin' or 'network'. It is labeled BASIN.HYD. It contains all the necessary hydrologic data of all the gauges defined in the network, but the data is converted to represent the LOCAL SUPPLY to each gauge. This is done by subtracting the total upstream flow from the flow at each particular gauge.

Before this calculation can be performed, the network must be defined along with the hydrology data file of each gauge. If the periods of hydrologic record do not coincide among all the gauges, the program will use only the period that overlaps all gauges in the basin (that is, from the LATEST START to the EARLIEST FINISH). It is advisable to ensure that the periods of streamflow record are the same for all the nodes selected as part of the network, otherwise the overall length of the analysis will be compromised.

Whenever the streamflow from an upstream gauge(s) is subtracted from the streamflow at a downstream gauge to obtain the local supply to the downstream gauge, a negative inflow value can result. This is due to changes in storage in the intervening reach, or to minor measurement errors. The user has the option to choose how such negative values are handled. They may be either set to zero or left negative.

Typical contents of this file are described in Appendix C-6.

4.3.7 - Gauge Run File

For each gauge in the network, the program creates a run file containing the same information as the gauge data file, but with all values escalated using the growth scenarios chosen for the particular run.

The file is given the same name as the gauge data file, with the extension '.RUN' (e.g., G05CC002.RUN). It is illustrated in Appendix C-7.

4.3.8 - Input/Output Matrix Files

An input/output matrix describes the interrelationships between sectors of the economy. These linkages are generally based on the value of production and services exchanged among all sectors for a given year. The matrix rows represent outputs of one sector, and columns represent inputs to one sector. The mathematical inverse of such a matrix is a new matrix of coefficients, often referred to as the impact matrix. The coefficients are referred to as multipliers. These multipliers are used to determine the direct and indirect effects of changes in final demand within one or more sectors. Utilizing the industrial water use coefficients, I/O multipliers can estimate the increase in water consumption caused by an exogenous increase in final demand (e.g., a tar sands development).

There are two types of matrices contained in the model

- intraregional inverse matrices, which express the impacts between sectors within a specific economic region of Canada for a given sector of final demand

- interregional trade matrices, which express the sectoral linkages between economic regions.

If the user is applying an industrial forecast which has these effects built in, then the matrices should be bypassed, since there would otherwise be a double counting error. If, on the other hand, the forecast does not include input/output effects, then the matrices should be applied. In this case, the model will route the predicted industrial growth through the appropriate interregional and intraregional matrices, using an iterative procedure. The iterations can be truncated early (e.g., two iterations) without losing a significant degree of accuracy. The matrices are discussed individually below.

(a) Intraregional Input/Output Matrices

For the purpose of industrial water use forecasting, the inverses of the input/output matrices have been computed and published by Statscan (based on the 1974 national input/output data) for the 30 major industrial sectors and for each economic region. Such an inverse input/output matrix shows the relationship between increases in finally consumed output from a particular sector and total increases in the output of all sectors needed to support that increase in final consumption.

The coefficients in the inverse input/output matrix show the necessary increase (or decrease) in the total output of the sectors along the top of the matrix (columns) that will result from the increase (or decrease) of one more unit of final demand in the sectors down the left side of the matrix (rows). The matrix developed for British Columbia is presented in Table 4.2. The coefficients in the matrix show the increase in total output which would result from a unit increase in final consumption of the output from another industrial sector. These coefficients correspond to the multipliers that are due to the interconnection of sectors within a region's economy. Using Table 4.2 as an example, a dollar increase in final demand for the forestry sector output (Sector 2) would cause a 0.02137-dollar increase in total output from the agricultural sector (Row 2, Column 1), an additional 0.23194-dollar increase in forestry sector

TABLE 4.2

SAMPLE INTRAREGIONAL INVERSE
INPUT/OUTPUT MATRIX -
BRITISH COLUMBIA ECONOMIC REGION

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	.04174	.00191	.00090	.00174	.00122	.14897	.00000	.00087	.00109	.00406	.00250	.00117	.00230	.00113	.00070	.00215	.00071	.00097	.00000	.00082	.00143	.00074	.00152	.00110	.00140	.00101	.00027	.00067	.01570	.00584
2	.02137	.23194	.00120	.00233	.00276	.07822	.00000	.00316	.01000	.00214	.40676	.04003	.10200	.03201	.00129	.00196	.00203	.00209	.00087	.00290	.00727	.00130	.00330	.00754	.02147	.00239	.00073	.00131	.00357	.00490
3	.00012	.00043	.00135	.00021	.00032	.00016	.00000	.00013	.00013	.00006	.00025	.00028	.00025	.00027	.10855	.00100	.00244	.00230	.00117	.00696	.00282	.00011	.00041	.00181	.00084	.00020	.00007	.00009	.00013	.00028
4	.00801	.00087	.00356	.00390	.00736	.00332	.00000	.00211	.00070	.00124	.00522	.00140	.01046	.00264	.00723	.00265	.00120	.00132	.00100	.00146	.01064	.27062	.00567	.00257	.00397	.01063	.00302	.00286	.00371	.00240
5	.00130	.00139	.02667	.01740	.04679	.00070	.00000	.00030	.00024	.00015	.00083	.00029	.00102	.00036	.00376	.00159	.00032	.00111	.00026	.00047	.02862	.00511	.00094	.00116	.01751	.00108	.00050	.00081	.00034	.00090
6	.18572	.00540	.00243	.00315	.00325	.07840	.00000	.00236	.00266	.00267	.00460	.00195	.00359	.00249	.00160	.00300	.00159	.00193	.00165	.00180	.00379	.00207	.00532	.00264	.00205	.00225	.00073	.00161	.00521	.01851
7	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
8	.00036	.00039	.00018	.00034	.00025	.00114	.00000	.01016	.00071	.00175	.00042	.00091	.00041	.00026	.00014	.00022	.00021	.00008	.00212	.00518	.00088	.00031	.00110	.00527	.00243	.00030	.00009	.00018	.00056	.00095
9	.00000	.00002	.00001	.00001	.00001	.00001	.00000	.00003	.00386	.00053	.00001	.00020	.00002	.00013	.00000	.00001	.00000	.00000	.00001	.00001	.00001	.00001	.00001	.00003	.00001	.00001	.00000	.00000	.00002	.00005
10	.00046	.00108	.00010	.00019	.00030	.00023	.00000	.00075	.00735	.04464	.00056	.00932	.00029	.00014	.00007	.00017	.00021	.00011	.00209	.00014	.00017	.00010	.00013	.00047	.00093	.00040	.00005	.00010	.00087	.00059
11	.00257	.00303	.00146	.00290	.00280	.00453	.00000	.00354	.01907	.00233	.00129	.00310	.14437	.02537	.00182	.00256	.00303	.00298	.01843	.00368	.00987	.00175	.00298	.01189	.04430	.00242	.00124	.00212	.00355	.00400
12	.00003	.00009	.00003	.00005	.00004	.00004	.00000	.00003	.00004	.00002	.00088	.00637	.00022	.00006	.00002	.00003	.00002	.00002	.00194	.00035	.00005	.00003	.00003	.00004	.00049	.00007	.00002	.00003	.00004	.00015
13	.00510	.00294	.00184	.00298	.00756	.02263	.00000	.01102	.00857	.00671	.00400	.01205	.04051	.17901	.00209	.00276	.00342	.00433	.00278	.00852	.01840	.00148	.01073	.01641	.00502	.00194	.00061	.00101	.01063	.00804
14	.00214	.00618	.00268	.00572	.00367	.00473	.00000	.00223	.00302	.00192	.00500	.00244	.00370	.04823	.00184	.00310	.00178	.00207	.00182	.00243	.00396	.00233	.00329	.00429	.00216	.00463	.00096	.00182	.00370	.02079
15	.00034	.00048	.00320	.00171	.00146	.00057	.00000	.00018	.00069	.00008	.00032	.00095	.00032	.00018	.00472	.39442	.02964	.03084	.00447	.00365	.00155	.00058	.00047	.00129	.00294	.00038	.00010	.00017	.00019	.00058
16	.00060	.00113	.00853	.00119	.00163	.00073	.00000	.00088	.00068	.00027	.00089	.00224	.00167	.00215	.03702	.01620	.02300	.02020	.01092	.06604	.00086	.00059	.00304	.01684	.00493	.00071	.00052	.00041	.00047	.00161
17	.00297	.00833	.00352	.00384	.00217	.01769	.00000	.00434	.00849	.00138	.00574	.02693	.00740	.00276	.00488	.00418	.09361	.03136	.03936	.03163	.01058	.00380	.01396	.00984	.04662	.00361	.00139	.00247	.00364	.00757
18	.00082	.00374	.00446	.00507	.00423	.00104	.00000	.00079	.01477	.00051	.00223	.00100	.00138	.00187	.00473	.00386	.00453	.02608	.00369	.00212	.00170	.00164	.00102	.00190	.00285	.00111	.00029	.00062	.00093	.00584
19	.00036	.00744	.00026	.00048	.00041	.00071	.00000	.00066	.00032	.00018	.00322	.00057	.00135	.00052	.00026	.00040	.00146	.00166	.00850	.00074	.00040	.00032	.00034	.00076	.00084	.00728	.00009	.00033	.00048	.00130
20	.00042	.00106	.00043	.00078	.00046	.00038	.00000	.00036	.00033	.00019	.00074	.00126	.00050	.00036	.00035	.00051	.00125	.00583	.00281	.02060	.00054	.00047	.00040	.00170	.00942	.00246	.00030	.00057	.00040	.00200
21	.00330	.00164	.00242	.00155	.00110	.01193	.00000	.00094	.00044	.00030	.00132	.00070	.00130	.00061	.00141	.00361	.00076	.00149	.00114	.00116	.13664	.00136	.00219	.00119	.04252	.00177	.00108	.00183	.00061	.00231
22	.02815	.02760	.01125	.00938	.02474	.00935	.00000	.00559	.00230	.00315	.01502	.00387	.02830	.00733	.01366	.00372	.00238	.00259	.00263	.00326	.02394	.01050	.01066	.00772	.01024	.03303	.00950	.00849	.01081	.00711
23	.00986	.00186	.01153	.01067	.00909	.00315	.00000	.14068	.00281	.00332	.00502	.00494	.02700	.00928	.00212	.00197	.00322	.00160	.00494	.01962	.00734	.00499	.07093	.01004	.00619	.00093	.00030	.00053	.00103	.00294
24	.00039	.00271	.00039	.00063	.00060	.00055	.00000	.00147	.00203	.00177	.00146	.00120	.00080	.00065	.00023	.00043	.00031	.00038	.00050	.00115	.00262	.00166	.00136	.03525	.00195	.00094	.00013	.00026	.00045	.00189
25	.02618	.02941	.01940	.03226	.01289	.01317	.00000	.00797	.00688	.00531	.02300	.00834	.01689	.00996	.01219	.01084	.00732	.00764	.00756	.00808	.01506	.02673	.01403	.00883	.00656	.03773	.02512	.04199	.01074	.04308
26	.01867	.08462	.01658	.02821	.03004	.02221	.00000	.01632	.01671	.01442	.04717	.01647	.02915	.03291	.01175	.02021	.01404	.01672	.01629	.02298	.02523	.03010	.02366	.02167	.01941	.10716	.00540	.03307	.04066	.07285
27	.01233	.00358	.02360	.00684	.00835	.00668	.00000	.01512	.00337	.00716	.01138	.00600	.02205	.00962	.00817	.02275	.00584	.00688	.00586	.00875	.01508	.00739	.04541	.00745	.00320	.00709	.02765	.00720	.01078	.00507
28	.00423	.00057	.00078	.00304	.00123	.00229	.00000	.00200	.00040	.00100	.00198	.00086	.00490	.00137	.00202	.00325	.00113	.00098	.00082	.00107	.00806	.00318	.00623	.00104	.00070	.00070	.00119	.00033	.00165	.00103
29	.03763	.03022	.01655	.02375	.02317	.03796	.00000	.01826	.02552	.02994	.03116	.03812	.02275	.01939	.01712	.09475	.01941	.03237	.02340	.02156	.02931	.01220	.02107	.02447	.04101	.02563	.00483	.01504	.01656	.05553
30	.09309	.32328	.14319	.30904	.19165	.13808	.00000	.11155	.10769	.07897	.26368	.10890	.18536	.14283	.09003	.16672	.09296	.10559	.09586	.10700	.19380	.12136	.15271	.13467	.11171	.12505	.04365	.09507	.14743	.13164

Note: The factors along the diagonal (that is, the effect of a sector's growth on itself) should represent only the additional "circulation" effect. The model will attribute the full forecasted growth to the sector before calculating the additional "circulation" effects.

total output (Row 2, Column 2), a 0.00128-dollar increase in metal mines sector total output (Row 2, Column 3), etc.

The files are identified with the appropriate region name and the extension '.I-O' (e.g., BC.I-O). The required data contents are defined in Appendix C-8.

(b) Interregional Matrices

A sample sector of the interregional matrix, the forestry sector, is presented in Table 4.3. One of these has been prepared for each of 30 industrial sectors based on interprovincial trade flows for 1974. The matrix shows the linkage between economic regions and international trade. The coefficients in the matrix show the increase in output required from each region to meet a one dollar increase in final output from the region of interest. Using Table 4.3 as an example, a one dollar increase in forestry output in British Columbia would be contributed from the economic regions as follows.

BC	0.9612 (Row 1, Column 1)
Prairies	0.0003 (Row 2, Column 1)
Ontario	0.0001 (Row 3, Column 1)
Quebec	0.0000 (Row 4, Column 1)
Atlantic	0.0000 (Row 5, Column 1)
International	0.0384 (Row 6, Column 1)

It is, of course, necessary by virtue of the above coefficient definition that the columns of each matrix sum to 1.0.*

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*The matrix could have been transposed in such a way as to show relative distribution of one additional dollar of output between the regions.

TABLE 4.3

SAMPLE INTERREGIONAL STRUCTURAL COEFFICIENT MATRIX - SECTOR 2 - FORESTRY

	BC	Prairies	Ontario	Quebec	Atlantic	International	Total
BC	0.9612	0.0350	0.0027	0.0007	0.0001	0.4610	1.4607
Prairies	0.0003	0.8846	0.0004	0.0000	0.0000	0.0889	0.9742
Ontario	0.0001	0.0026	0.8640	0.0010	0.0000	0.1235	0.9912
Quebec	0.0000	0.0002	0.0045	0.8882	0.0070	0.0853	0.9852
Atlantic	0.0000	0.0000	0.0002	0.0002	0.9735	0.24121	0.2151
International	0.0384	0.0775	0.1283	0.1099	0.0194	0.0000	0.3735
TOTAL*	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	6.0000

Notes:

- A particular horizontal row shows how the total sold (transacted) output of the forestry sector in that particular region is proportionally demanded in each region, e.g., 31.6% $\frac{(0.4610 \times 100)}{(1.4607)}$ of forestry sector sold output in BC is exported out of Canada.
- A particular vertical column shows where inputs are derived to produce one dollar of output from the forestry sector of a particular region, e.g., 3.8% of total forestry sector purchases in BC are imports from outside

---

*Totals may not add to 1.0 due to rounding errors.

While the WUAM has the capability to utilize the interregional matrix, provincially based data were not available for incorporation into the data base. Therefore, the user should ensure that growth forecast data includes the effects of cascading. This matrix is not required for estimating the effects of an exogenous increase in final demand and can therefore be bypassed if an appropriate forecast is used.

The 30 matrix sectors are stored in one file labeled NATIONAL.I-O. Its format is illustrated in Appendix C-9.

4.3.9 - Irrigation Area Data File

This file contains all the data describing the specific features of an irrigation area (such as crop types, soil types, etc), as well as any number of forecast scenario descriptions of the area. In effect, the file is a combination of the forecast file and the gauge data file used for the other water use sectors.

All the data in this file must be provided by the user. Because of the detailed nature of the water use evaluations, there are a substantial number of crop, soil and irrigation type parameters which must be provided. Therefore, the data parameters expected in this file are not duplicated in the general data base file described in Section 4.3.1, and the general data base parameters cannot be overridden by data in this file.

The file name must consist of the letter 'I', the 7-character (maximum) area identifier, and the extension '.DAT'. The file must be created by the user and there must be one file for each irrigation area to be considered. The required data contents are defined in Appendix C-10.

4.3.10 - Precipitation Data File

This file contains historic precipitation data, by month, for different stations or areas in the basin. Any number of sets of data may be recorded, and any such data file can be accessed by more than one irrigation area. There is no specific option in the program to list this data; however, it may be printed using DOS commands (see Appendix B) and should be checked manually to ensure it is correct.

The file name must consist of the letter 'P', a 7-character (maximum) area identifier, and the extension '.DAT'.

The file must be created by the user, and the required data contents are defined in Appendix C-11.

4.3.11 - Reference Potential Evapotranspiration Data File

This file contains historic monthly potential evapotranspiration data for different stations or areas in the basin in the same format as the precipitation data file. Any number of sets of data may be recorded, and any such data file can be accessed by more than one irrigation area. There does not have to be the same number of evapotranspiration files as there are precipitation files.

The file name must consist of the letter 'E', a 7-character (maximum) area identifier, and the extension '.DAT'.

The file must be created by the user, and the required data contents are defined in Appendix C-12.

4.3.12 - Irrigation Area Run File

This file contains the monthly supply and return flow volumes generated from an evaluation of irrigation water use in the irrigation area. The calculated monthly flow volumes correspond to the irrigation season from May to September inclusive, and to every year for which there are data in the precipitation and potential evapotranspiration data file for the irrigation area. A separate file is produced for each irrigation area.

This file is generated by program MODULE 7B. It is given the same name as the irrigation area data file, with the extension '.RUN', and is illustrated in Appendix C-13.

4.3.13 - Reservoir Evaporation Data File

This file must be provided for each reservoir in the network. It is a historical record, by month, of the gross evaporation from, and precipitation on, the reservoir, both expressed in millimetres. It is used to calculate the net monthly evaporation from the reservoir, using the equation

NET EVAPORATION = GROSS EVAPORATION MINUS GROSS PRECIPITATION.

The file name must consist of the letter 'E', the 7-character (maximum) node identifier, and the extension '.DAT'.

The file must be created by the user and the required data contents are defined in Appendix C-14.

4.3.14 - Gauge Boundary Flows Data File

This file must be provided for each node in the network that is a 'boundary' node. The model automatically defines a node as a boundary if its outflow passes to a node in a different province.

The data in this file represent the total natural flows at the boundary. A specified percentage of the natural flow in the data file must be passed across the boundary. If, during normal operation, the model is unable to satisfy the required flow, it will

- draw down reservoirs in the province to their lower rule curve

- then apply rationing to the nodes in the upstream province (if reservoir drawdown does not satisfy boundary flow criterion).

The data is a historical record, by month, of the streamflows at the boundary, preceded by the percentage of the flows that must be passed to the next province. The file name must consist of the letter 'B', the 7-character (maximum) node identifier, and the extension '.DAT'.

The file must be created by the user, and the required data contents are defined in Appendix C-15.

4.3.15 - Growth Distribution Factors Data File

This file contains data describing how the general industrial growths are to be distributed among the different nodes in the basin. It is not meant to facilitate the application of different growth rates to different nodes. (This can be done by running MODULE 7 for different nodes.)

The file must be named DFACTORS.DAT. It must be created by the user. The required data contents are defined in Appendix C-16.

If the user does not want to do any distribution adjustments, the file should consist entirely of factors of unity. Otherwise, the originally calculated industrial growth factor for the region is modified for a particular node as follows

$$\text{OLD AMOUNT}_n = \text{INTAKE}_n * \text{EF}_r$$

$$\text{NEW AMOUNT}_n = \text{OLD AMOUNT}_n * \text{DF}_n$$

$$\text{ADJUSTMENT FACTOR} = \frac{\sum_{n=1}^{\text{nodes}} \text{OLD AMOUNT}_n}{\sum_{n=1}^{\text{nodes}} \text{NEW AMOUNT}_n}$$

$$\text{NEW DF}_n = \text{DF}_n * (\text{ADJUSTMENT FACTOR})$$

where

EF = escalation factor
DF = distribution factor
n = node
r = region.

Note that this calculation will guarantee that total growth amounts are maintained in the basin, but only if the user runs MODULE 7 for all nodes in the basin at once. If the user chooses to run the module for different nodes with different growth rates, then overall basin growth cannot be maintained. Thus, the user is warned to use these distribution factors with caution.

4.3.16 - Efficiency Change Factors Data File

This file contains data describing how future technological changes may alter the anticipated water intake for each industrial sector. The user may specify a number of 'scenarios' and the year in which these factors would apply. The model will automatically pick the set of factors that apply in the forecast year (on the basis of the year closest to the forecast year, but not exceeding it).

The file must be named EFACTORS.DAT, and it must be created by the user. The required data contents are described in Appendix C-17.

4.3.17 - Industrial Demand Curves Data File

This file contains data describing the relationship between price and intake for each industrial sector.

There is one file for each economic region which must be created by the user. (Section 4.4.4 explains how the industrial demand curve can be varied for different nodes.) The file name must be the region name with the extension '.$$$'. The required data contents are described in Appendix C-18.

4.3.18 - Domestic Demand Curves Data File

This file is very similar to the industrial demand curves data file, with the exception that it relates to domestic water use by province.

There is only one file and it must be named PROVINCE.$$$. (Section 4.4.4 explains how the domestic demand curve can be varied for different nodes.) It must be created by the user. The required data contents are described in Appendix C-19.

4.3.19 - Thermal Power Data Base File

This file contains basic information describing thermal power plants. It defines the hydrological designations such as wet, dry or average that will describe each year of the simulation.

The plants are described by the cooling types, fuel types, and condenser types. The file also contains the default values for intake and consumption coefficients, expressed in MCM/GW·h.

The file name must be TPOWERDB.DAT, and its specific contents are described in Appendix C-20.

4.3.20 - Hydrology Specification File

This file lists all the years in the simulation, together with the hydrology of each (e.g., wet, average, dry). The hydrologic descriptions must match those defined in TPOWERDB.DAT. This file is called HYDROLGY.DAT, and is described further in Appendix C-21.

4.3.21 - Thermal Power Plant Data File

This file contains the characteristics of all thermal plants that might appear in the simulation: location, installed capacity, intake and consumption coefficients, etc. It must be called THERMAL.DAT, and its contents are described in Appendix C-22.

4.3.22 - Hydro Power Station Data File

This file contains the characteristics of all hydro stations that might appear in the simulation: location, installed capacity, average head, efficiency, etc. It must be called HYDRO.DAT, and it is described in detail in Appendix C-23.

4.3.23 - Electric Energy Scenario Data File

This file contains information about all the scenarios that will be examined. It defines which hydro and thermal plants will be on line for any given run, as well as the monthly thermal energy that will be produced during each type of hydrology. This last information is used in conjunction with the appropriate coefficients to calculate thermal plant water intake and consumption. The file must be called POWER.DAT, and its contents are outlined more fully in Appendix C-24.

4.3.24 - Thermal Plant Water Use Run File

This file is produced from the five preceding ones by MODULE 7C. It is a record of the water requirements of each thermal plant in the scenario being examined, including the effects of off-stream storage for both intake and return. The file is called THERMAL.RUN, and is documented in Appendix C-25.

4.3.25 - Hydro Station Run File

This file contains the same information as HYDRO.DAT, but only for the hydro plants in the scenario being examined. Unlike HYDRO.DAT, however, it also contains the forecast year of this scenario. It is called HYDRO.RUN, and it is described in Appendix C-26.

4.3.26 - Simulation Outflow File

This file is produced by MODULE 8, and it contains a list of the outflows at each node in the network, in every month of the simulation. It is used by MODULE 10 to calculate hydro generation. It is called OUTFLOWS.DAT, and it is described in Appendix C-27.

4.3.27 - Graphics Data Files

There are three files which contain the results of a simulation run in a form suitable for graphical representation. One file (labeled PLOTTER.SUM) contains all the nodal summary information, while the other (labeled PLOTTER.RES) contains all reservoir information. These files are created by the main simulation program, MODULE 8. Another file (labeled PLOTTER.HYD) contains the hydroelectric generation values. It is created by the energy calculation program, MODULE 10. Since these files are meant to be used only by the computer, they are illustrated in Appendixes C-28, C-29 and C-30, respectively, but no accompanying description has been included.

4.3.28 - Regulated Gauge Hydrology File

This file contains regulated streamflow data, by month, for specific gauges. It is used at a gauge to account for the presence of a reservoir or storage facility when it is not appropriate to model it as a reservoir in the simulation.

This file is accessed by program MODULE 6 and replaces the local inflow values after they are calculated by the program. That is, the natural streamflow record at the gauge is first used to calculate the correct local inflows at downstream nodes. Then, this file replaces the calculated inflow values at the gauge.

The file name must consist of the letter 'R', the 7-character (maximum) gauge identifier and the extension '.DAT' (e.g., R05CC002.DAT).

The file must be created by the user. Its presence for any particular gauge is optional. The required data contents are defined in Appendix C-31.

4.3.29 - Simulated Gauge Hydrology File

This file contains the simulated monthly streamflow data for specific gauges. It has the same format as the gauge hydrology file, discussed in Section 4.3.4. However, it actually represents the simulated outflow of the gauge and can be used as a gauge hydrology file in a different network or for subsequent subnetwork analysis.

The file is created by program MODULE 6C. The required data contents are defined in Appendix C-32.

4.3.30 - Imperial Gauge Hydrology File

In previous versions of the model, hydrologic data was in imperial units (cubic feet per second). This version of the model has been converted to metric units (cubic meters per second). Program MODULE 6B was added to convert a hydrology file from cubic feet per second to cubic meters per second units.

The file name must consist of the letter 'H', the 7-character (maximum) gauge identification and the extension '.CFS' (e.g., H05CC002.CFS). The required data contents are described in Appendix C-33.

4.4 - Model Components

The program is composed of 16 modules (see Figure 4.5). Each is run as a separate program by entering the command 'MODULEx', where 'x' is a one or two character identifier, as follows

1 - list general data base file
2 - list forecast data file
3 - list gauge data files
3B - list irrigation area data files
3C - list electric energy data files
4 - list basin data file
5 - configure a basin
6 - generate basin hydrology file
6B - convert hydrology files
6C - generate simulated streamflow files
7 - generate gauge forecast files
7B - generate irrigation area forecast files
7C - generate thermal plant water use forecast file

8 - perform historical simulation
9 - generate plots
10 - perform hydro power calculations.

The modules are all described in the following sections. Sample excerpts from the output of the modules are listed in Appendix D, and sample screen echoes for each are provided in Appendix E.

4.4.1 - List Options (MODULES 1,2,3,3B,3C,4)

Each of these modules specifically lists all the data in the appropriate file to the printer. The user must choose the file desired. The module program will read it, and list the contents in the appropriate format. Only by listing the files in this manner can one determine if the correct values are in the file. These listing modules perform some data checks that are not done in the calculation module (such as ensuring, for example, that the specified consumption of water does not exceed 100% of the water use). After any data file is changed, it should be listed immediately and checked. Sample printouts for the six list options are provided in Appendixes D-1 to D-6, respectively.

4.4.2 - MODULE 5: Configure a Basin

This interactive module guides the user in the process of laying out the basin or network to be analyzed, and creates the basin configuration data file.

The network should first be laid out on paper, following the rules discussed in Section 4.3.5.

The first piece of data that must be defined is the total number of nodes in the network. The program will then prompt for the node number and the adjacent downstream node numbers associated with each. Remember to specify all upstream nodes before any downstream nodes. The program will prompt only for downstream node numbers since it can search for the appropriate upstream node numbers. If no upstream nodes are found, then the program assumes that this node is at the top level of the network. Two other rules apply.

- The first node in the network cannot have any upstream nodes.
- The last node in the network cannot have a downstream node.

Next, the program prompts for the number of irrigation areas to be linked to the network. For each area the user must identify

- the supply nodes (maximum of 3) and the percentage of total supply to apportion to each

- the return nodes (maximum of 3) and the percentage of total return to apportion to each

- the name of the file containing the precipitation data

- the name of the file containing the evapotranspiration data.

Once the file is created, the user should list the file to the printer using MODULE 4 (see Appendix D-7).

Since data input can be a very tedious exercise (and prone to errors), the data file is continuously updated by the program. If there is an error in the user input (or there is simply a problem with the computer hardware), the user does not have to start over again. There is an option in the module to read the existing data file (which must be named BASIN.OLD) and then to continue with user input of the missing data.

4.4.3 - MODULE 6: Generate Basin Hydrology File

This module creates one file for the network containing all the hydrologic data for each gauge in the basin. The data are converted to LOCAL SUPPLY at each gauge by using the network relationships defined in the basin configuration data file. The local supply at a node is calculated as

local supply = streamflow at this node minus sum of streamflows at nodes directly upstream.

The user can choose whether resulting negative values are left as they are or whether they are set to zero, as explained in Section 4.3.6.

The file will only contain the period of record that is common to all gauge hydrology files. The user is first notified by the program of the length of this common record and then asked if he wishes to continue. If the length of record is unsatisfactory, it is necessary either to generate synthetic streamflow records or to remove the node(s) which is (are) limiting the common record length from the network.

Once all the calculations are done and before the file is created, the user can change the values for any particular node. This is useful when the user wants to use a specific streamflow record at a node to represent regulated flows. The unregulated flow record is needed initially so that correct calculations of local inflow can be made at downstream nodes. Then, another file (named Gxxxxxxx.REG) will be read and its contents will override the calculated values of local inflow for this node.

The output basin hydrology file will be assigned the name BASIN.HYD. A complete printout of the file can be obtained using DOS commands (see Appendix B and Appendix D-8).

4.4.4 - MODULE 6B: Convert Hydrology Files

MODULE 6B is a utility program that converts a gauge hydrology data file from imperial (cubic feet per second) flow units to metric (cubic meters per second) flow units. This version of the model assumes that all flow data is in metric units.

If your data is in imperial units, then this program will perform the necessary conversion. Firstly, though, you must ensure that all the data files to be converted have the extension '.CFS'. These include hydrology files (beginning with 'H'), boundary flow files (beginning with 'B') and regulated flow files (beginning with 'R').

The program displays instructions to the user.

4.4.5 - MODULE 6C: Generate Simulated Streamflow Files

MODULE 6C is a utility program that reads the OUTFLOWS.DAT data file from a simulation run. It allows you to select some, or all, of the nodes in the network to generate a gauge hydrology file. This feature is useful for applications where the simulated streamflows will be used in another network.

The program displays instructions to the user, noting that the outflow values in million cubic meters per month are converted to cubic meters per second units. Also, the program forces the user to pick new gauge identifiers so that the original streamflow file is not overwritten.

Although the file is generated in exactly the same format as a regular gauge hydrology data file, identification lines are appended to the file to warn the user that the file actually contains simulated data. The lines consist of

- a warning line
- forecast year, and
- three lines of run description.

4.4.6 - MODULE 7: Generate Gauge Forecast Run Files

This is an interactive module that first requests the choice of year for the forecast. The model simulates only one forecast year at a time but examines it using the entire period of hydrologic record. The limiting factor for the choice of year will be the number of years of population growth data available, since the population forecasts are input by year. All other forecasts are in terms of annual percentage growth, so any year can be forecast.

Next, the model prompts for the choice of population, livestock, and industrial growth scenarios. These will be presented strictly as a choice of numbers [e.g., 'Choose population growth scenario (1-4)']. Reference must then be made to the printout from program MODULE 2 to determine the particular scenario.

For the industrial growth option, there is a field in the forecast data file to specify whether or not a particular growth scenario is to include the 'circulation' calculations between regions and between sectors within the region. The correct choice depends on the growth scenario used. Many forecasts generated by public bodies (e.g., the Economic Council of Canada) have included this circulation effect in their forecast. Thus, their scenarios should not be routed through the circulation calculations of the model or the results will be erroneous. The program will automatically do the appropriate calculations if necessary.

As the calculations for each region are performed, there is a final opportunity to alter the output of each sector in terms of dollars. The model displays the output and prompts the user for any changes desired. AGAIN, USERS ARE CAUTIONED ABOUT MAINTAINING CAREFUL RECORDS REGARDING THE RUNS TO WHICH THESE SPECIFIC ALTERATIONS ARE MADE, SINCE THE PRINTOUT WILL NOT DISPLAY THIS FACT. Regardless of the type of scenario being used to this point (i.e., with or without circulation effects) users are also prompted to decide whether or not circulation effects, IN THE REGION ONLY, are to be applied to this specific amount. This amount cannot be circulated to other regions.

Next the user must choose whether or not to investigate the effects of price changes in both the industrial and municipal categories.

The output of this module is a set of gauge run files (one for each node in the network) along with a detailed printout (see Appendix D-9).

The same forecast assumptions are normally applied to each node in the network (with some assumptions being related to the province or economic region in which a particular node is located). However, this does not preclude the user from applying different assumptions to particular nodes. This can easily be done as follows.

- Run MODULE 7 and apply a given set of forecast conditions to all nodes in the network.

- Rerun MODULE 7 and apply a different set of forecast conditions to selected nodes in the network. These assumptions will then overwrite those previously created.

AGAIN, USERS ARE CAUTIONED TO MAINTAIN CAREFUL RECORDS REGARDING THESE MANEUVERS.

4.4.7 - MODULE 7B: Generate Irrigation Area Forecast Run Files

This module performs an evaluation of monthly crop irrigation water use for an individual irrigation area. The period of evaluation is based on the period of the precipitation and evapotranspiration records. Details of the module are given in the Phase III Summary Report (Reference 3).

The result of the evaluation is both a printed summary (see Appendix D-10) and an irrigation run file. The run file contains the monthly irrigation supply and return volumes for the irrigation area, covering the full period of the precipitation record. One such file is produced for each irrigation area.

4.4.8 - MODULE 7C: Generate Electric Energy Forecast Run Files

This module evaluates water use by individual thermal power plants over the period for which the hydrology is described. Details are provided in the Phase VI Summary Report.

Three files are produced by this module. One is a summary of the scenario under consideration (see Appendix D-11), one is a record of thermal plant intakes, consumptions and return flows, and one is a collection of hydro plant characteristics for the scenario of interest. The second file is used by MODULE 8, the third by MODULE 10.

4.4.9 - MODULE 8: Perform Historical Simulation

This module performs the water use summation calculations and compares the results with the network streamflows. Based on the basin configuration data file, it accesses the information stored in the basin hydrology file and the individual gauge, irrigation and thermal power run files. Output is directed to a group of summary files, but the amount of output can be substantial depending on the number of nodes in the network and the number of years of hydrology. For this reason, there are options available to the user to suppress some of the output.

The module first determines the period to be studied. The basin hydrology file at this point already represents a full reconciliation among records for the various nodes However, this may not coincide with the length and years of record used to evaluate monthly irrigation water use in each irrigation area (or the length of record in the reservoir evaporation files, or the boundary flow files). Therefore, the lengths of record of all files are reconciled to establish the period to be simulated.

Secondly, the module consolidates the gauge run file monthly water use evaluations to produce total values for the major nonirrigation sectors, namely domestic, livestock, industrial, thermal energy generation and specific energy project developments. Printout of intake and consumption amounts at each node is available along with average values for electric energy generation, irrigation, groundwater supply, diversions, minimum flows, evaporation, and boundary flows (see Appendix D-12).

Finally, the module performs the historical simulation of supply and demand by month and node number, as outlined in Section 4.1 and illustrated in Figure 4.3. The printout of the water balance at all nodes of the network is optional, and can be either a full printout of totals for every month, season or year (see Appendixes D-13, D-14 and D-15), or a summary printout, which will contain only those values which are identified as critical in some respect.

A critical node balance is defined according to three separate conditions. For each of these three conditions, flag characters are printed at the end of the line, as shown below in parentheses.

- the total intake exceeds the total supply (*..)
- the total consumption exceeds the total supply (.*.)
- the outflow is less than the minimum flow requirement (..!).

Files that document the basin network, reservoir operations, and boundary shortage details are also provided (see Appendixes D-16 through D-18).

The next set of printouts, which are not optional, consist of six summary tables for each node in the network (see Appendix D-19).

The first of these tables compares the total demanded intake with the total available supply (i.e., excluding water that must be passed downstream to satisfy a boundary apportionment agreement, and that is therefore unavailable for use at the node), summarizing the number of occurrences that correspond to given ranges of percentage ratio of demanded intake to available supply (namely, 0 -19%, 20 - 39%,..., 180% and over). The second table is similar, except that it compares total demanded consumption with total available supply. The third table is again similar except that it compares minimum flow requirements with the available stream outflow from the node.

In all three tables, occurrences at the high end of the percentage scale indicate potential problems.

The fourth table provides a perspective of average and extreme magnitudes of monthly, seasonal and annual supply and demand at the node.

The last two tables summarize consumption cutbacks that are necessitated by boundary flow shortfalls. The first indicates the frequency of occurrence of required cutbacks, while the second communicates the magnitude of the cutbacks in each water use category.

If a reservoir is located at the node, then an additional table is generated giving a summary of reservoir levels and outflows. If the node is a boundary node, then a summary of boundary flow shortages is provided.

MODULE 8 also creates two output files that are used as input for MODULE 9. All the data contained in these files can be represented in graphic form. One file contains all the nodal summary information. The other file contains all the reservoir information. Both files contain the forecast year and description used in MODULE 8 so that any graphics generated can be directly related to the proper simulation run.

Finally, MODULE 8 generates a file containing outflows at each node for every month of the simulation. These flows are used by MODULE 10 to calculate hydro generation.

4.4.10 - MODULE 9: Generate Graphics

This module converts output data from MODULE 8 into graphic form. The graphs can be routed to a number of output devices (including the screen, a printer and a plotter).

Only the actual graph is displayed on the screen. Legends and titles are excluded so that the user gets the best possible view of the data. Error messages produced because of these exclusions should be ignored.

The graph (including legends and titles) is scaled to fit on a standard sheet of paper (8.5" by 11") on a hard copy device.

When this module is run the user is prompted to enter the date. However, all output from this module is in graphic form and the date is not required in the printer output. The run description from MODULE 8 is used to relate the graph to the appropriate simulation run. Therefore, the user need only press the 'Enter' key in response to the date prompt.

The program reads the necessary data files (namely, DATABASE.DAT, BASIN.DAT, PLOTTER.SUM and, if there are any reservoirs in the network, PLOTTER.RES).

There are five basic types of data that can be displayed

- demand summary (for all nodes)
- simulation summary (for all nodes)
- node results
- reservoir results
- irrigation area results.

Because of the various types of data, there are actually 29 chart options that the user may select. These are listed in Table 4.4.

In all cases, the graph is scaled automatically. This is done so that there will be some consistency between the scales generated for different scenarios. However, to allow the available graph space to be utilized most effectively, there are actually 3 scales available for the Y axis (0 - 1, 0 - 0.5 or 0 - 0.25). The maximum value of each graph line is reduced to one of these scales (by dividing by 10 in a loop and incrementing a power index). Then the power factor (i.e., 10 raised to the power index) is applied to the scale.

Appendix E-14 illustrates a sample run. All of the demand summary and simulation summary data is read at the beginning of the program (and can take a few minutes for a large network with a long simulation period). However, the remainder of the data is read when the particular chart option is chosen.

TABLE 4.4

CHART OPTIONS

Option 1	Suboption 2	Suboption 3	Suboption 4
demand summary	intake	seasonal	
		annual	
	consumption	seasonal	
		annual	
	minimum flow	seasonal	
		annual	
simulation summary	intake	monthly	
		total	
		seasonal	
		annual	
	consumption	monthly	
		total	
		seasonal	
		annual	
	minimum flow	monthly	
		total	
		seasonal	
		annual	
node results	node choice	monthly supply/ demand volumes	
		streamflow time series	
		irrigation time series	
		boundary flow time series	
		energy time series	
reservoir results	reservoir choice	elevation	time series summary
		discharge	time series summary
		inflow/outflow time series	
irrigation area results	area choice	intake/consumption time series	

The first program choice is the selection of the output device and its scaling factor. Output devices are divided into two categories: screen or hardcopy. The scale factor is normally 1. A larger factor will simply expand the size of the chart and could exceed the physical limits of the output device. A smaller factor can be used on hardcopy devices to reduce the output time (i.e., to get a quicker preview of the chart).

The demand summary options generate stacked demand bar charts for all nodes. Each bar stacks 7 categories of demand. These are the values contained in the MODULE 8 printout file labeled MODULE8.DMD. The categories are

- domestic
- livestock
- industrial
- energy projects
- average generation
- average irrigation
- diversions out of the node.

The simulation summary options generate stacked simulation result bar charts for all nodes. Each bar stacks 4 categories of summary values. These are the values contained in the MODULE 8 printout file labeled MODULE8.SUM. In the printout file, there are 10 categories of demand as a percentage of supply. For graphic display, 10 stacks would be too confusing, so the results are consolidated into four categories as follows

- greater than 120%
- 100% to 120%
- 80% to 100%
- less than 80%.

Each stack of the bar represents the percentage of occurrence of events within the corresponding category, and each bar must total 100%. The bars are 'stacked' beginning with the most critical category. This makes it easier to identify the nodes that have potential problems. Additionally, the fill pattern for the last category (i.e., less than 80%) is not used on the graph so that it does not dominate the appearance of the graph.

If the user selects a monthly option, there is an additional prompt for the month number.

For node results, the first option generates a line graph of monthly average supply and demand volumes for a particular node.

The lines that are plotted represent

- average supply
- average demanded intake
- average demanded consumption
- average outflow
- minimum required outflow.

Because there can be a substantial difference in the maximum values of these lines, the user has the option to pick one particular line as the only one to be checked for scaling purposes. Otherwise, all lines will be checked and the scale will be chosen such that all lines will fit on the graph.

However, if the user does define one particular line for scaling, then there can be no guarantee that all lines will fit on the graph. Therefore, the user is further prompted to decide what to do with lines that exceed the maximum scale. There are two choices:

- to zero all values in a line that would exceed the scale, or
- to attempt to plot all lines.

In the former case, a line will be drawn along the X-axis. It will still be included in the legend list.

In the latter case, a line will be drawn off scale. It will be drawn up to the physical borders of the output device (even though that means that it will pass through the plot title). The program will generate error messages, such as

```
PLOT88 ERROR#4   xxx UNPLOTTABLE VECTORS
PLOT88 ERROR#5    xx CLIPPED VECTORS
```

but the accuracy of the graph will not be affected. These are the same messages that are generated for any plot when a screen output device is selected, since only the actual graph is designed to fit on the screen (and legends and titles are off scale).

The remaining node chart options generate time series graphs of the chosen data. There are also time series graphs for reservoir results and irrigation area results. For any time series, the user must select a period of record to plot because the output device usually cannot accommodate the entire simulation period. On a screen device, the limit is 5 years per chart. On a hard-copy device, the limit is 10 years. However, to ensure that all sections of the time series have the same scale, the entire period of record is used to calculate the scaling factors. Therefore, in any particular chart, it may appear that the program did not choose the optimal scale.

For reservoir results, there is also the option to plot simulation summary charts for elevation and discharge. These charts indicate the percentage of occurrence of events within the corresponding category.

4.4.11 - MODULE 10: Calculate Hydro Generation

This module takes hydro plant characteristics (average head, efficiency, etc) and uses them in conjunction with nodal outflows to calculate how much hydro power and energy would be available if the system were operated as simulated in MODULE 8.

The output from this module is a summary of monthly power and energy, for each hydro plant in the current scenario, for the duration of the simulation (see Appendix D-21). The module also generates a data file labeled PLOTTER.HYD containing the energy values. This file is accessed by program MODULE 9 to plot a time series of energy generation at a node. Therefore, for correct plotting of energy generation for a particular simulation run, MODULE 10 must be run after MODULE 8 and before MODULE 9.

5 - OPERATING PROCEDURES

5 - OPERATING PROCEDURES

To perform an analysis, the user must first create all the necessary data files, define the network and choose a forecast, then run the analytical modules. The process is illustrated in Figure 5.1. In fact, the process appears more ominous than it really is, since very few of the data files change between runs. The diagram illustrates the order and frequency that one can normally expect to alter certain files.

The process can be broken down into 8 operations.

- Create the basic data files (i.e., the national and regional matrices and the general data base file) using the screen editor program. Thoroughly review the contents of these files and place them on a master data diskette.

- Create the forecast file using the screen editor program. Again, thoroughly examine the contents of the file (using program MODULE 2). Include all possible growth scenarios. It is better to include them in the original file than to revise the file later. Create the other associated files (No. 16, 17, 18 and 19).

- Lay the basin network out on paper (with all nodes, irrigation areas, reservoirs, etc). Run MODULE 5 of the program to create the configuration file.

- Create one gauge hydrology file for each node in the network, using the screen editor. Run MODULE 6 to create the basin hydrology file. If required, run MODULE 6B to convert hydrology files from ft^3/s to m^3/s before running MODULE 6.

- Create the gauge detail files, using the screen editor program. These files must be created separately for each node in the network. The amount of data to be included will depend on the items defined in

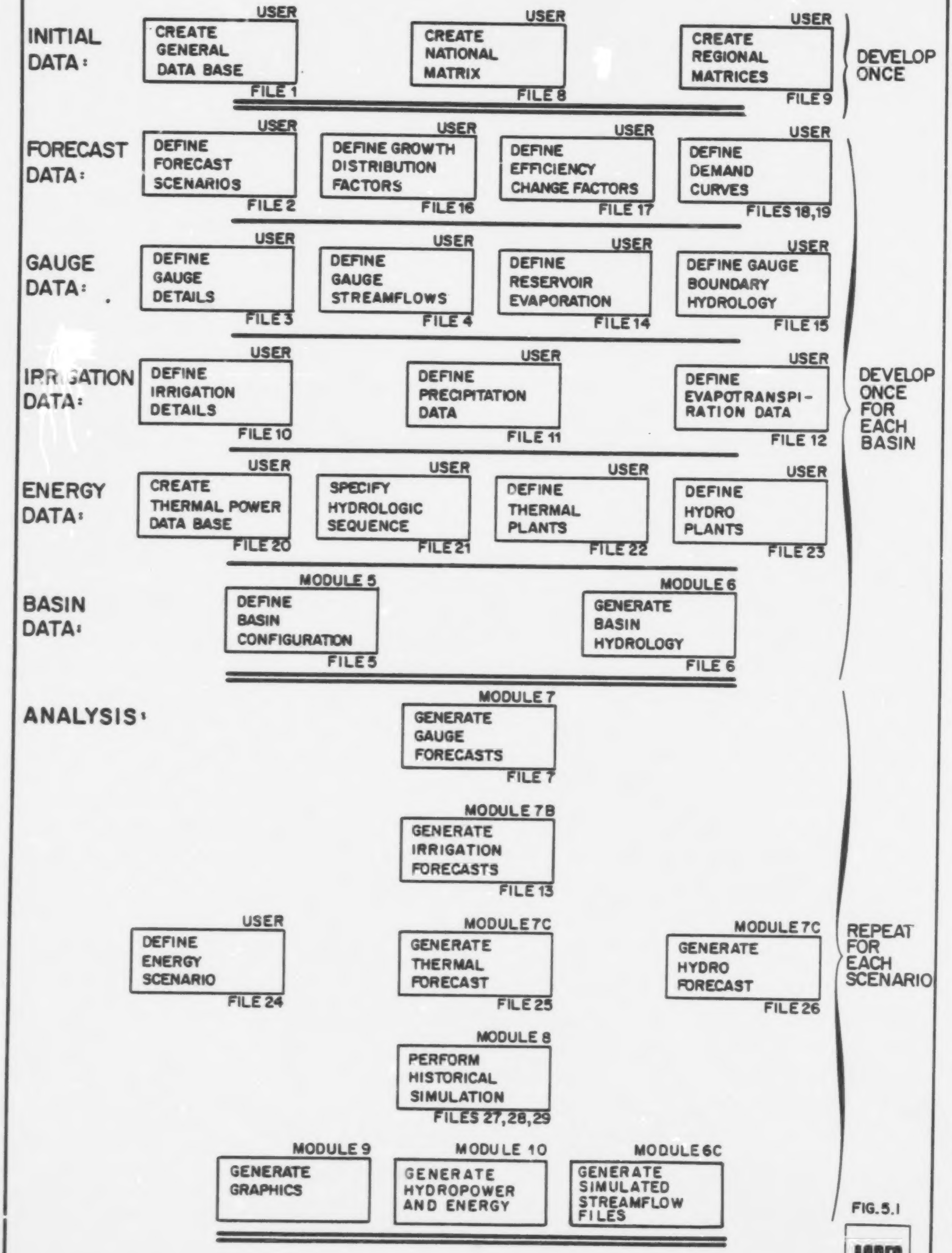
INITIAL DATA:
USER
CREATE GENERAL DATA BASE
FILE 1
USER
CREATE NATIONAL MATRIX
FILE 8
USER
CREATE REGIONAL MATRICES
FILE 9
DEVELOP ONCE
FORECAST DATA:
USER
DEFINE FORECAST SCENARIOS
FILE 2
USER
DEFINE GROWTH DISTRIBUTION FACTORS
FILE 16
USER
DEFINE EFFICIENCY CHANGE FACTORS
FILE 17
USER
DEFINE DEMAND CURVES
FILES 18,19
GAUGE DATA:
USER
DEFINE GAUGE DETAILS
FILE 3
USER
DEFINE GAUGE STREAMFLOWS
FILE 4
USER
DEFINE RESERVOIR EVAPORATION
FILE 14
USER
DEFINE GAUGE BOUNDARY HYDROLOGY
FILE 15
IRRIGATION DATA:
USER
DEFINE IRRIGATION DETAILS
FILE 10
USER
DEFINE PRECIPITATION DATA
FILE 11
USER
DEFINE EVAPOTRANSPIRATION DATA
FILE 12
DEVELOP ONCE FOR EACH BASIN
ENERGY DATA:
USER
CREATE THERMAL POWER DATA BASE
FILE 20
USER
SPECIFY HYDROLOGIC SEQUENCE
FILE 21
USER
DEFINE THERMAL PLANTS
FILE 22
USER
DEFINE HYDRO PLANTS
FILE 23
BASIN DATA:
MODULE 5
DEFINE BASIN CONFIGURATION
FILE 5
MODULE 6
GENERATE BASIN HYDROLOGY
FILE 6
ANALYSIS:
MODULE 7
GENERATE GAUGE FORECASTS
FILE 7
MODULE 7B
GENERATE IRRIGATION FORECASTS
FILE 13
USER
DEFINE ENERGY SCENARIO
FILE 24
MODULE 7C
GENERATE THERMAL FORECAST
FILE 25
MODULE 7C
GENERATE HYDRO FORECAST
FILE 26
REPEAT FOR EACH SCENARIO
MODULE 8
PERFORM HISTORICAL SIMULATION
FILES 27,28,29
MODULE 9
GENERATE GRAPHICS
MODULE 10
GENERATE HYDROPOWER AND ENERGY
MODULE 6C
GENERATE SIMULATED STREAMFLOW FILES

FIG. 5.1

OPERATING PROCEDURE

the general data base file (such as the number of livestock types) and therefore the general data base must be finalized before the gauge data are prepared.

- Create the irrigation area detail files, and the precipitation and evapotranspiration data files, using the screen editor program. One irrigation area detail file must be created for each irrigation area in the basin; however, more than one irrigation area may reference the same precipitation or evapotranspiration files. The irrigation area file is also, in effect, the forecast file for the irrigation area. It may contain any number of future scenarios. Again, it is advisable to include all possible scenarios in this file from the start.

- Create the electric energy data files using the screen editor. There are 5 files required, including POWER.DAT (No. 24), which should contain all possible power plant scenarios.

- Perform the analyses on the basin. This involves creating various gauge run files (using program MODULE 7), evaluating water use by each irrigation area (using program MODULE 7B) and by thermal power plants (using program MODULE 7C), performing the final water balance simulation (using program MODULE 8), calculating hydropower generation (using program MODULE 10), and finally generating the appropriate plots (using MODULE 9).

  Note that MODULE 10 must be run before MODULE 9 to ensure that the hydropower calculations have been calculated for the simulation run just performed. Otherwise, the hydropower results from a previous simulation could accidentially be plotted.

- If subsequent subnetwork analyses are required, run MODULE 6C to generate simulated streamflow files.

LIST OF REFERENCES

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APPENDIX A

SYSTEM OPERATION

APPENDIX A

SYSTEM OPERATION

General

The program is designed to run on a microcomputer system with a hard disk, operating under DOS Version 2.1 or higher. A subdirectory structure must be defined, as illustrated in Figure A-1, with the proper file types located in each subdirectory. All printout files, regardless of module, will be stored in the printout subdirectory (\DATA\PRINTOUT). Other output files will be stored in the appropriate subdirectory.

When multiple basins are being studied, it is useful to define additional subdirectories for each one (such as \DATA\BASIN\BASIN1, \DATA\BASIN\BASIN2, etc). In each of these subdirectories you should store the particular BASIN.DAT and BASIN.HYD files for the basin. Then, before running a particular analysis, 'COPY' these two files up one subdirectory level.

Program Layout

To the user, the system consists of 16 modules (as illustrated in Figure 4.5) plus one additional module (MODULE 0) to list all the other modules available. In the FORTRAN computer language, the system is written as 17 main programs, 35 subroutine files and 16 common blocks. The relationships between the FORTRAN routines and the system modules are illustrated in Tables A-1, A-2 and A-3. Three of the subroutines (MODULES 8A, 8B, 8C) are listed as main programs because they are really all part of the one program MODULE 8. However, the code is too large to compile as one file. Some of the other subroutine files actually contain more than one subroutine (PLOTSUBS, START, UTILITY).

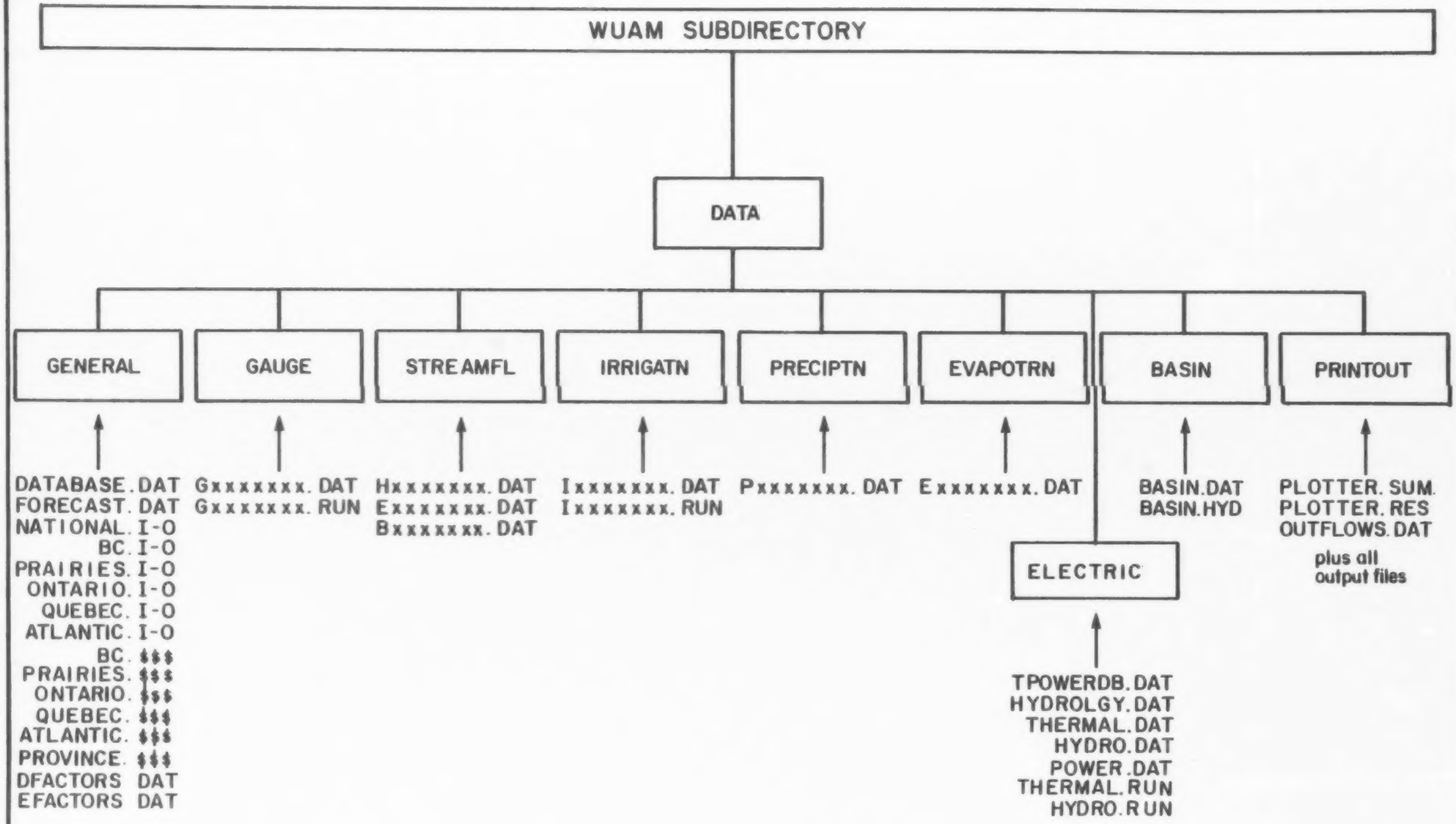
WUAM SUBDIRECTORY
DATA
GENERAL
GAUGE
STREAMFL
IRRIGATN
PRECIPTN
EVAPOTRN
BASIN
PRINTOUT
ELECTRIC
DATABASE.DAT
FORECAST.DAT
NATIONAL.I-O
BC.I-O
PRAIRIES.I-O
ONTARIO.I-O
QUEBEC.I-O
ATLANTIC.I-O
BC.$$$
PRAIRIES.$$$
ONTARIO.$$$
QUEBEC.$$$
ATLANTIC.$$$
PROVINCE.$$$
DFACTORS DAT
EFACTORS DAT
Gxxxxxxx.DAT
Gxxxxxxx.RUN
Hxxxxxxx.DAT
Exxxxxxx.DAT
Bxxxxxxx.DAT
Ixxxxxxx.DAT
Ixxxxxxx.RUN
Pxxxxxxx.DAT
Exxxxxxx.DAT
BASIN.DAT
BASIN.HYD
PLOTTER.SUM
PLOTTER.RES
OUTFLOWS.DAT
plus all output files
TPOWERDB.DAT
HYDROLGY.DAT
THERMAL.DAT
HYDRO.DAT
POWER.DAT
THERMAL.RUN
HYDRO.RUN

FIG. A-1

FILE LOCATIONS ON HARD DISK

ACRES

TABLE A-1

COMMON BLOCKS ACCESSED BY MAIN PROGRAM MODULES

Fortran	Common Block															
File	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MODULE0	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.
MODULE1	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.
MODULE2	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.
MODULE3	X	X	X	X	X	.	.	.	.	.	.	.	.	.	.	.
MODULE3B	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.
MODULE3C	X	X	X	.	.	.	.	.	.	.	.	.	.	X	.	.
MODULE4	X	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.
MODULE5	X	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.
MODULE6	X	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.
MODULE6B	X	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.
MODULE6C	X	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.
MODULE7	X	X	X	X	X	.	X	.	X	.	.	.	.	.	.	.
MODULE7B	X	X	X	X	.	X	.	.	.	.	.	.	.	.	.	.
MODULE7C	X	X	X	.	.	.	.	.	.	.	.	.	.	X	.	.
MODULE8	X	X	X	X	X	.	.	X	.	.	X	X	.	.	.	.
MODULE8A	X	X	X	X	X	.	.	X	.	.	X	.	.	.	.	.
MODULE8B	X	X	X	X	X	.	.	X	.	X	X	.	.	.	.	.
MODULE8C	X	.	X	X	X	.	.	X	.	X	X	X	.	.	.	.
MODULE9	X	.	X	X	X	.	.	X	.	.	.	.	X	.	.	X
MODULE10	X	X	X	X	.	.	.	.	.	.	.	.	.	X	.	.

TABLE A-2

COMMON BLOCKS ACCESSED BY PROGRAM SUBROUTINES

Fortran	Common Block															
File	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ADJUST	X	X	X	X	X	.	.	.	X	.	.	.	.	.	.	.
CHANGES	X	X	X	.	.	.	.	.	.	.	.	.	.	.	X	.
CLIMATE	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.
CURVES	X	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.
CUTBACKS	X	X	.	X	.	.	.	X	.	X	X	.	.	.	.	.
GETAREA	X	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.
GETNODE	X	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.
GRAPH1	X	.	.	X	.	.	.	.	.	.	.	.	X	.	.	.
GRAPH2	X	.	.	X	.	.	.	.	.	.	.	.	X	.	.	.
GRAPH3	X	.	X	X	.	.	.	.	.	.	.	.	X	.	.	X
INITALIZ	X	X	.	X	.	.	.	.	.	X	.	.	.	.	.	.
NATIONAL	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.
PLOTSUBS	X	.	X	X	.	.	.	X	.	.	.	.	X	.	.	.
PRINTOUT	X	.	X	X	.	.	.	X	.	X	.	X	.	.	.	.
READALL	X	X	X	X	X	.	.	.	.	.	.	.	.	.	.	.
READAREA	X	X	X	X	.	X	.	.	.	.	.	.	.	.	.	.
READBASN	X	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.
READDB	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.
READDIST	X	X	X	X	.	.	.	.	X	.	.	.	.	.	.	.
READEFCY	X	X	X	X	.	.	.	.	X	.	.	.	.	.	.	.
READFOR	X	X	X	.	.	.	X	.	.	.	.	.	.	.	.	.
READNODE	X	X	X	X	X	.	X	.	.	.	.	.	.	.	.	.
READPLOT	X	.	X	X	X	.	.	X	.	.	.	.	X	.	.	.
READPOWR	X	X	X	.	.	.	.	.	.	.	.	.	.	X	.	.
READPRIC	X	X	X	.	.	.	.	.	.	.	.	.	.	.	X	.
REGIONAL	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.
RESEVOIR	X	.	.	.	X	.	.	.	.	X	.	.	.	.	.	.
SHORTAGE	X	.	X	X	X	.	.	X	.	.	.	.	.	.	.	.
STAKDBAR	X	.	.	X	.	.	.	.	.	.	.	.	X	.	.	.
START	X	.	X	X	.	.	.	X	.	.	.	.	.	.	.	.
STOREVAL	X	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.
UTILITY	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.

TABLE A-3

MAIN PROGRAM MODULES
ACCESS OF SUBROUTINES

Fortran File	Modules																
	0	1	2	3	3B	3C	4	5	6	6B	6C	7	7B	7C	8	9	10
ADJUST	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.
CHANGES	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.
CLIMATE	.	.	.	.	.	.	.	.	.	.	.	.	X	.	X	.	.
CURVES	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.
CUTBACKS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.
GETAREA	.	.	.	.	X	.	.	.	.	.	.	.	X	.	.	X	.
GETNODE	.	.	.	X	.	.	.	.	X	.	X	X	.	.	.	X	.
GRAPH1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.
GRAPH2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.
GRAPH3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.
INITALIZ	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.
NATIONAL	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.
PLOTSUBS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.
PRINTOUT	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.
READALL	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.
READAREA	.	.	.	.	X	.	.	.	.	.	.	.	X	.	.	.	.
READBASN	.	.	.	X	X	.	X	.	X	X	X	X	X	.	X	X	X
READDB	.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
READDIST	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.
READEFCY	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.
READFOR	.	.	X	.	.	.	.	.	.	.	.	X	X	.	.	.	.
READNODE	.	.	.	X	.	.	.	.	.	.	.	X	.	.	X	.	.
READPLOT	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.
READPOWR	.	.	.	.	.	X	.	.	.	.	.	.	.	X	.	.	X
READPRIC	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.
REGIONAL	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.
RESEVOIR	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.
STORAGE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.
STAKDBAR	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.
START	.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STOREVAL	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.
UTILITY	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Program Execution

The model is actually composed of 16 separate programs (one for each of the model modules). There is one main program, labeled WUAM, that displays the list of modules. To run a particular module, enter the command 'MODULEx', where 'x' is the module number (i.e., one of 1, 2, 3, 3b, 3c, 4, 5, 6, 6B, 6C, 7, 7B, 7C, 8, 9 or 10).

Sample runs are included in Appendixes E-1 to E-15 to illustrate the actual process involved in running each module. The sample printouts are the actual screen displays (echoed to the printer) for running the test case.

FORTRAN Code

The program was, as much as possible, written in standard FORTRAN code. However, some differences are as follows.

1 - File specifications on the PC hard disk consist of a drive letter, a colon, a path name, an 8-character file name, a period, and a 3-character file type (e.g., C:\DATA\GENERAL\DATABASE.DAT). When the user enters a file name, a subroutine (FILESP) is called to concatenate all the components of the file specification into a 29-character string. The subroutine was written because there is no explicit character concatenation function available in Microsoft FORTRAN, and has been retained even though the code has been converted to Ryan-McFarland Fortran.

2 - Device number '0' refers to the terminal. Both SCREEN and KEYBRD are defined as unit 0, for output and input operations, respectively. For example, WRITE(SCREEN,10) means to display something to the screen (according to format 10). Similarly, READ(KEYBRD,*) means to read something from the keyboard in 'free field' format.

3 - The backslash character ('\') can be used in format statements to suppress the line feed. It is used for data input from the keyboard, so that prompt messages stay on the same line as the data input.

4 - The INCLUDE command is used to insert an external file into the source code at compile time. In this code, it is used to add COMMON block files into the various routines. There are 16 such files (labeled COMMON0.FOR through COMMON15.FOR).

APPENDIX B

LISTING DATA FILES

APPENDIX B

LISTING DATA FILES

There are two ways to list a file to the printer--using the system commands, or using one of the list options in the program. The advantage in using the program is that it will perform checks on the data and print formatted results. However, some files have not been included as program options. This is because those files do not have a mixture of data types [illegible] a straight listing should be readily understandable. Such files include the national and regional matrix files, gauge and basin hydrology files, gauge run files, irrigation area run files, and precipitation and evapotranspiration files.

To list such files on a parallel printer, use the DOS 'COPY' command and copy the file to the printer, as follows

```
COPY filename.typ PRN
```

or, use the DOS 'PRINT' command, as follows

```
PRINT filename.typ
```

In the case of other devices, such as a serial printer, the user should refer to the DOS users manual.

APPENDIX C

DESCRIPTION OF DATA FILES

APPENDIX C

DESCRIPTION OF DATA FILES

In a number of data files, descriptor fields are included. The data in such a field are read but not processed by the program. That is, the description must be present, but it is not checked for correctness. The field is provided as a comment field solely for the user's convenience when editing the file. The field must be enclosed in single quotes and has no specific length. The correct order for any data is that defined in the general data base file. It should be listed before any other data is input.

In all files, the data may be entered in 'free-field' format. That is, data fields need to be separated from one another by either one, or more, spaces or a comma. However, the sample data files follow a general formatting arrangement, and users are encouraged to follow this example.

One cautionary note about free-field formats: If there are not enough data items on one line, a READ command will automatically look to the next line, but if a line contains more numbers than are required by the READ, the extras are ignored, and a new line is read by the next READ statement. Therefore, there should not be too many data items included on a single line. In general, a new line should be started any time there is a space in the input description, any time data is being repeated (e.g., for each month, for each province, etc), any time it makes sense to do so, and any time there is doubt.

There are three types of data variables expected by the program

- string: any combination of characters enclosed in single quotes

- integer: a numeric value without a fractional or decimal part

- real: a numeric value with a fractional part.

Throughout the data files two conventions are followed:

- In files that contain yearly data input, the end of file is indicated by the 4-digit value '9999' (e.g. File 4 - Gauge Hydrology File).

- In files that allow default data values, any negative value will force the default to be used. In the same files, those variables that can have default values have been represented by the value '-99' (e.g. File 3 - Gauge Data File).

Sections C1 to C27 provide detailed descriptions and examples of each type of data file. Samples of the plotter files produced and used by the computer are included in Sections C28 and C29. The purpose of presenting this input is twofold.

- The user is provided with typical data and is able to see the typical data arrangement.

- It represents a set of data checks. If these data are used in the model, the results presented in Appendix D should be duplicated. If they are not, then either some program or data modification has been made.

Each file description is accompanied by a generic file name. Any uppercase letters must be used in specific file names exactly as shown. Lowercase x's must be replaced by a meaningful descriptor of the user's choice. The number of x's indicates the maximum number of characters that may be used, but does not represent a minimum.

The basin network to which the sample data applies is illustrated in Figure C-1.

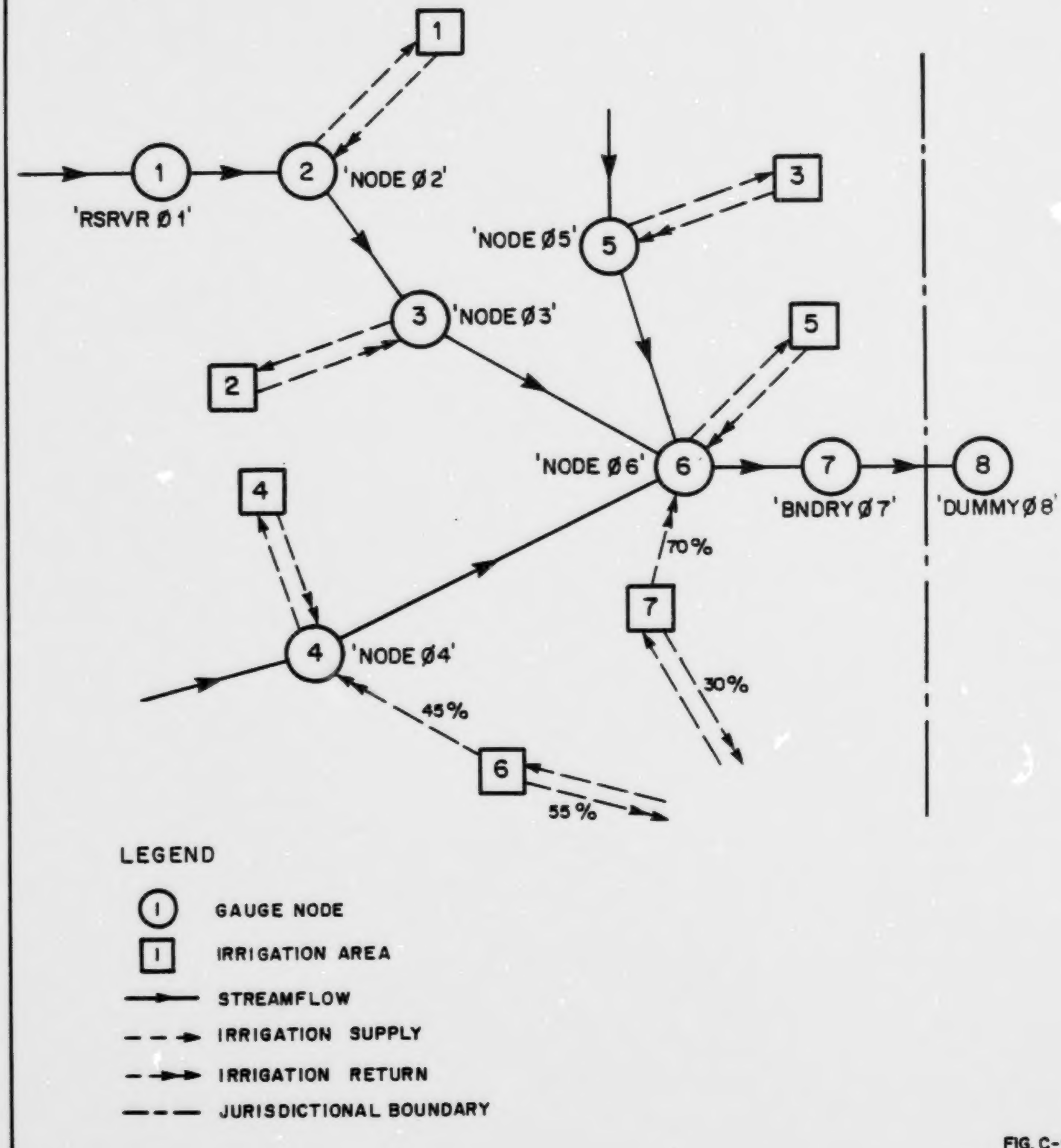
1
'RSRVR 01'
2
'NODE 02'
3
'NODE 03'
4
'NODE 04'
5
'NODE 05'
6
'NODE 06'
7
'BNDRY 07'
8
'DUMMY 08'
1
2
3
4
5
6
7
70%
30%
45%
55%
LEGEND
1
GAUGE NODE
1
IRRIGATION AREA
STREAMFLOW
IRRIGATION SUPPLY
IRRIGATION RETURN
JURISDICTIONAL BOUNDARY

FIG. C-1

SAMPLE NETWORK

In all cases, the data files have either a specific length or a specific end of file indicator (such as '9999'). Therefore, the user can add any other descriptive information at the end of the file. This technique was used in program MODULE 8 which creates the OUTFLOWS.DAT file (see Section 4.4.5).

APPENDIX C1

DESCRIPTION OF DATA FILES

FILE 1
GENERAL DATA BASE

C1 - GENERAL DATA BASE FILE

File Name: DATABASE.DAT

```
descriptor (string)
Base Year (integer)

descriptor (string)
Number of Months (integer)

Month Name (5-character string) --------------------> repeat for
Number of Days per Month (integer) -----------------> each month

descriptor (string)
First Irrigation Month (integer)

descriptor (string)
Last Irrigation Month (integer)

descriptor (string)
Number of Economic Regions (integer)

Region Name* (8-character string) ------------------> repeat for
                                                      each region

descriptor (string)
Number of Cutback Increments (integer)

descriptor (string)
Number of Provinces (integer)

Province Name (15-character string) ----------------> repeat
Economic Region Number (integer)                    > for each
Water Use Priority (integer)**                      > province
                                                    >
descriptor (string) -------------> repeat for       >
Cutback Increments*** -----------> each category --->
```

---

* String is limited to 8 characters and must not include periods, spaces, or other special characters as the program uses this string as the file name for the regional matrix data.

** The four water use categories are (1) domestic, (2) livestock, (3) industrial and (4) irrigation. The water use priority numbers represent the category numbers, input in order from lowest to highest priority. Four values are, therefore, needed for each province.

***Number of values for each category is the Number of Cutback Increments (above).

```
descriptor (string)
Groundwater Flag*(integer)

descriptor (string)
Number of Urban Uses (integer)

Urban Usage Name (15-character string) -----------------> repeat
                                                          > for
Water Intake (real), L/d/capita-------------> repeat     > each
Consumption Percentage (real)                > for each   > urban
Monthly Distribution Factor** (real) -------> province -> usage

descriptor (string)
Number of Rural Uses (integer)

Rural Usage Name (15-character string) -----------------> repeat
                                                          > for
Water Intake (real), L/d/capita -----------> repeat      > each
Consumption Percentage (real)               > for each    > rural
Monthly Distribution Factor** (real) ------> province --> usage
Descriptor (string)
Number of Livestock Types (integer)

Animal Name (15-character string) -------------------> repeat
Water Intake (real), L/d/head                         > for each
Consumption Percentage (real) -----------------------> type

descriptor (string)
Number of Crop Types (integer)

Crop Name (25-character string) ---------------------->
Monthly Crop Factors** (real)                          >
                                                       > repeat
Minimum Optimal Depletion Fraction (real)              > for each
Maximum Optimal Depletion Fraction (real)              > crop
Depletion Equation Constant A (real)                   > type
Depletion Equation Constant B (real)                   >
Monthly Depletion Adjustment Factors*** (real)         >
                                                       >
Maximum Root Depth (real), m                           >
Monthly Root Depth Adjustment Factors*** (real)        >
                                                       >
Maximum Soil Salinity for 90% crop yield               >
  (real), mmhos/cm                                     >
```

---

* Zero means groundwater is not used, one means that groundwater supplies are accounted for.

** One value for each month (which must sum to 12).

***One value for each month.

```
Maximum Soil Salinity for 0% crop yield (real)          > repeat
  mmhos/cm                                              > for each
                                                        > crop
Monthly Soil Salinity Adjustment Factors* (real)        > type
Depletion Fraction for which Evapotranspiration         >
  Fraction is 0.95 (real)                               >
Depletion Fraction for which Evapotranspiration         >
  Fraction is 0.10 (real)                               >
Evapotranspiration Fraction for which Depletion         >
  Fraction is 0.80 (real) ----------------------------->

descriptor (string)
Number of Soil Types (integer)

Soil Name (15-character string) ----------------------> repeat
Moisture Storage Capacity (real), mm/m                  > for each
Leaching Efficiency (real), %                           > soil
Percolation Efficiency (real), % ---------------------> type

descriptor (string)
Number of Irrigation Types (integer)


Irrigation Name (15-character string) ----------------> repeat for
Application Frequency Code (integer)                    > each irriga-
[1 = high, 2 = low] ----------------------------------> tion type

descriptor (string)
Number of Industrial Sectors (integer)

Sector Name (20-character string) -------------------->
Position in Regional Matrix (integer)                   > repeat
Water Intake** (real), Mm^3/yr                          > for
                                                        > each
Consumption Percentages* (real), %                      > sector
                                                        >
Final Demand Values* (real), $x10^6 ------------------>

descriptor (string)
Number of Energy Projects (integer)

Project Name (20-character string) ------------------->
Units Name (10-character string)                        > repeat
Water Use Coefficients (real), Mm^3/yr/unit             > for
                                                        > each
Consumption Percentages* (real), %                      > energy
                                                        > project
Monthly Distribution Percentages** (real) ------------>
```

---

* One value for each month.

**One value for each month (which must sum to 100).

file: DATABASE.DAT

```
'Base Year',      1981
'No. of Months', 12
     ' Jan ', 31
     ' Feb ', 28
     ' Mar ', 31
     ' Apr ', 30
     ' May ', 31
     ' Jun ', 30
     ' Jul ', 31
     ' Aug ', 31
     ' Sep ', 30
     ' Oct ', 31
     ' Nov ', 30
     ' Dec ', 31
'1st irrigation month', 5
'2nd irrigation month', 9
'No. of Economic Regions', 10
     'BC'
     'Alberta'
     'Sask'
     'Manitoba'
     'Ontario'
     'Quebec'
     'NB'
     'PEI'
     'NS'
     'Nfld'
'No. Cutback Increments', 10
'No. of Provinces', 4
     'B. C.        ',  1,  2, 4, 3, 1
'Domestic  '      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Livestock '      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Industrial'      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Irrigation'      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
     'Alberta      ',  2,  3, 2, 4, 1
'Domestic  '      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Livestock '      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Industrial'      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Irrigation'      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
     'Saskatchewan ',  2,  2, 4, 3, 1
'Domestic  '      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Livestock '      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Industrial'      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Irrigation'      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
     'Manitoba     ',  2,  2, 4, 3, 1
'Domestic  '      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Livestock '      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Industrial'      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Irrigation'      0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10  0.10
'Groundwater  Flag', 1
'No. of Urban Uses', 1
     'non-industrial '
     575., 20.0, 0.7, 0.7, 0.7, 1.0, 1.3, 1.3, 1.3, 1.3, 1.3, 1.0, 0.7, 0.7
     483., 20.0, 0.7, 0.7, 0.7, 1.0, 1.3, 1.3, 1.3, 1.3, 1.3, 1.0, 0.7, 0.7
     453., 20.0, 0.7, 0.7, 0.7, 1.0, 1.3, 1.3, 1.3, 1.3, 1.3, 1.0, 0.7, 0.7
     355., 20.0, 0.7, 0.7, 0.7, 1.0, 1.3, 1.3, 1.3, 1.3, 1.3, 1.0, 0.7, 0.7
'No. of Rural Uses', 1
     'general        '
     182., 70.0, 0.7, 0.7, 0.7, 1.0, 1.3, 1.3, 1.3, 1.3, 1.3, 1.0, 0.7, 0.7
     137., 70.0, 0.7, 0.7, 0.7, 1.0, 1.3, 1.3, 1.3, 1.3, 1.3, 1.0, 0.7, 0.7
     137., 70.0, 0.7, 0.7, 0.7, 1.0, 1.3, 1.3, 1.3, 1.3, 1.3, 1.0, 0.7, 0.7
     137., 70.0, 0.7, 0.7, 0.7, 1.0, 1.3, 1.3, 1.3, 1.3, 1.3, 1.0, 0.7, 0.7
'No. of Livestock Types', 6
     'beef cattle ',  20.4,  90.0
     'dairy cattle',  54.0,  70.0
     'horses      ',  68.0,  70.0
     'pigs        ',   6.0,  70.0
     'sheep       ',   3.5,  95.0
     'poultry     ',   0.3,  95.0
'No. of Crop Types', 3
```

```
'wheat (grains)'
                            0, 0, 0, 0,0.25,0.82,1.11,0.47,0.25, 0, 0, 0
    0.150,0.600,1.309,-.602,0, 0, 0, 0,0.80,1.00,1.00,1.20,1.00, 0, 0, 0
    1.20                    0, 0, 0, 0,0.22,0.64,0.98,1.00,1.00, 0, 0, 0
    7.400,20.00             0, 0, 0, 0,0.60,1.00,1.00,1.00,1.00, 0, 0, 0
    0.700,0.930,0.830
'alfalfa (forages)'
                            0, 0, 0, 0,0.80,0.94,0.95,0.83,0.73, 0, 0, 0
    0.150,0.700,1.309,-.602,0, 0, 0, 0,1.00,1.00,1.00,1.00,1.00, 0, 0, 0
    1.50                    0, 0, 0, 0,1.00,1.00,1.00,1.00,1.00, 0, 0, 0
    3.400,15.50             0, 0, 0, 0,1.00,1.00,1.00,1.00,1.00, 0, 0, 0
    0.750,0.950,0.900
'potato (specialities)'
                            0, 0, 0, 0,0.29,0.64,0.89,0.92,0.52, 0, 0, 0
    0.000,0.250,0.854,-.677,0, 0, 0, 0,1.00,0.90,0.90,1.00,1.10, 0, 0, 0
    0.60                    0, 0, 0, 0,0.31,0.70,1.00,1.00,1.00, 0, 0, 0
    2.500,10.00             0, 0, 0, 0,1.00,1.00,1.00,1.00,1.00, 0, 0, 0
    0.600,0.900,0.720
'No. of Soil Types', 4
'light',        60.0, 90.0, 40.0
'medium',      140.0, 70.0, 20.0
'med.-heavy', 170.0, 55.0, 15.0
'heavy',       200.0, 40.0, 10.0
'No. of Irrigation Types', 6
'furrow',          2
'border dyke',     2
'wheel roll',      2
'center pivot 1', 2
'center pivot 2', 1
'trickle/drip',    1

'No. of Industrial Sectors', 30
    'Agriculture         ', 1,      0.0,      0.0,      0.0,      0.0,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
                                    0.0,  1780.13,  1617.07,   660.64,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
    'Forestry, etc.      ', 2,      0.0,    0.019,    0.017,    0.022,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
                                   75.0,     75.0,     75.0,     75.0,     75.0
                                   75.0,     75.0,     75.0,     75.0,     75.0
                                    0.0,    11.66,    23.62,    13.31,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
    'Metal Mines         ', 3,      0.0,      0.0,    0.858,    1.152,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
                                   13.2,      0.0,      0.0,      0.0,     13.2
                                   13.2,     13.2,     13.2,     13.2,     13.2
                                    0.0,      0.0,   174.04,   192.89,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
    'Mineral Fuels       ', 4,      0.0,    8.348,    0.017,    0.507,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
                                   99.7,     12.4,      0.0,     90.7,     99.7
                                   99.7,     99.7,     99.7,     99.7,     99.7
                                    0.0,  4945.01,   193.85,      0.0,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
    'Non-Metal Mines     ', 5,      0.0,    6.882,   16.787,    0.799,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
                                   13.1,    10.87,     1.64,      0.0,     13.1
                                   13.1,     13.1,     13.1,     13.1,     13.1
                                    0.0,   927.11,   496.88,    15.90,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
    'Food & Beverages    ', 6,      0.0,   18.601,    4.341,   14.293,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
                                   11.8,    11.69,    19.93,     9.33,     11.8
                                   11.8,     11.8,     11.8,     11.8,     11.8
                                    0.0,  1722.48,   414.94,   812.69,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
    'Tobacco             ', 7,      0.0,      0.0,      0.0,      0.0,      0.0
                                    0.0,      0.0,      0.0,      0.0,      0.0
                                   24.2,     24.2,     24.2,     24.2,     24.2
                                   24.2,     24.2,     24.2,     24.2,     24.2
                                    0.0,      0.0,      0.0,      0.0,      0.0
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                                  0.0,    0.0,     0.0,     0.0,     0.0
'Rubber & Plastics     ', 8,      0.0,    0.442,   0.036,   0.138,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  8.3,    7.86,    0.08,    1.25,    8.3
                                  8.3,    8.3,     8.3,     8.3,     8.3
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Leather               ', 9,      0.0,    0.081,   0.004,   0.280,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,   12.83,    0.425,  15.73,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Textiles              ',10,      0.0,    0.346,   0.0,     0.015,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,    0.0,     0.0,     0.05,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,   36.56,   11.85,  162.11,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Wood                  ',11,      0.0,    0.001,   0.006,   0.025,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                 13.4,    0.0,     9.56,   96.69,   13.4
                                 13.4,   13.4,    13.4,    13.4,    13.4
                                  0.0,   40.73,   15.24,   16.84,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Furniture             ',12,      0.0,    1.080,   0.141,   1.159,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,   54.58,    1.66,   49.62,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Paper                 ',13,      0.0,    0.586,  34.683,  13,238,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                 11.1,    5.52,    0.20,    0.44,   11.1
                                 11.1,   11.1,    11.1,    11.1,    11.1
                                  0.0,   89.97,   62.91,   87.34,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Printing              ',14,      0.0,    0.122,   0.045,   0.116,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  2.9,    2.9,     2.9,     2.9,     2.9
                                  2.9,    2.9,     2.9,     2.9,     2.9
                                  0.0,  129.89,   27.80,   84.43,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Primary Metals- Iron',15,        0.0,    5.954,  12.234,   1.718,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                 17.9,   48.23,    6.80,    8.60,   17.9
                                 17.9,   17.9,    17.9,    17.9,    17.9
                                  0.0,    0.0,    35.61,  123.85,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Primary Metals-Other',16,        0.0,   33.149,   5.879,   5.553,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  4.37,   4.37,    4.37,    4.37,    4.37
                                  4.37,   4.37,    4.37,    4.37,    4.37
                                  0.0,    0.0,     0.0,    21.75,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Metal Fabricating     ',17,      0.0,    0.196,   0.012,   0.279,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,    3.11,    0.00,    0.00,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  0.0,    0.0,     0.0,    41.29,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Machinery             ',18,      0.0,    3.072,   1.294,   4.485,   0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  3.4,    3.4,     3.4,     3.4,     3.4
                                  3.4,    3.4,     3.4,     3.4,     3.4
                                  0.0,    5.41,   31.24   165.57,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
'Trans. Equipment      ',19,      0.0,    0.558,   0.003,   0.0597,  0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
                                  4.9,    6.32,    0.80,    4.20,    4.9
                                  4.9,    4.9,     4.9,     4.9,     4.9
                                  0.0,   13.02,   12.72,  142.84,    0.0
                                  0.0,    0.0,     0.0,     0.0,     0.0
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    'Electric Products   ',20,   0.0,    2.034,    0.564,    3.163,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 3.3,      3.3,      3.3,      3.3,    3.3
                                 3.3,      3.3,      3.3,      3.3,    3.3
                                 0.0,      0.0,      0.0,    31.38,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
    'Non-Metal Minerals  ',21,   0.0,    4.198,    0.323,    1.733,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                49.5,    42.06,    76.67,    64.39,   49.5
                                49.5,     49.5,     49.5,     49.5,   49.5
                                 0.0,   208.26,    37.22,    68.75,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
    'Petroleum & Coal    ',22,   0.0,   16.021,    1.506,    1.149,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                42.2,    42.69,    60.97,    28.70,   42.2
                                42.2,     42.2,     42.2,     42.2,   42.2
                                 0.0,   876.07,    27.98,     23.6,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
    'Chemicals           ',23,   0.0,   106.58,    1.054,    2.933,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                30.9,    30.89,    74.82,    67,47    30.9
                                30.9,     30.9,     30.9,     30.9,   30.9
                                 0.0,   262.93,      0.0       0.0     0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
    'Misc. Manufacture   ',24,   0.0,    0.801,    0.217,    0.788,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 8.6,      8.6,      8.6,      8.6,    8.6
                                 8.6,      8.6,      8.6,      8.6,    8.6
                                 0.0,      0.0      3.41,    14.21,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
    'Construction        ',25,   0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,   6386.2,   1412.6,   999.84,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
    'Transportation      ',26,   0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,   1898.8,    532.8,   1010.5,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
    'Electric Power      ',27,   0.0,  1020.80,   657.29,   55.907,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 3.8,     3.41,     3.67,     0.14,    3.8
                                 3.8,      3.8,      3.8,      3.8,    3.8
                                 0.0,   329.87,   132.05,   228.18,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
    'Other Utilities     ',28,   0.0,   286.11,   90.804,   107.08,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,     15.0,     15.0,     15.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,   109.73,    37.97,    39.16,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
    'Trade               ',29,   0.0,   55.232,   24.077,   37.584,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,   1976.2,   770.81,   909.02,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
    'Other               ',30,   0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
                                 0.0,   7767.6,   2029.0,   2277.1,    0.0
                                 0.0,      0.0,      0.0,      0.0,    0.0
'No. of Energy Projects', 12
'Coal, Conventional  ', 'Mt/yr     ',   0.32,   0.32,   0.32,   0.32,   0.32
                                        0.32,   0.32,   0.32,   0.32,   0.32
                                       25.00,  25.00,  25.00,  25.00,  25.00
                                       25.00,  25.00,  25.00,  25.00,  25.00
                 8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Coal, Hydraulic     ', 'Mt/yr     ',   0.44,   0.44,   0.44,   0.44,   0.44
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                                         0.44,   0.44,   0.44,   0.44,   0.44
                                        45.00,  45.00,  45.00,  45.00,  45.00
                                        45.00,  45.00,  45.00,  45.00,  45.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Coal, Slurry        ', 'barrels/dy',    0.00,   0.00,   0.00,   0.00,   0.00
                                         0.00,   0.00,   0.00,   0.00,   0.00
                                        00.00,  00.00,  00.00,  00.00,  00.00
                                        00.00,  00.00,  00.00,  00.00,  00.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Coal, Liquefaction  ', 'Mt/yr     ',    0.00,   0.00,   0.00,   0.00,   0.00
                                         0.00,   0.00,   0.00,   0.00,   0.00
                                        00.00,  00.00,  00.00,  00.00,  00.00
                                        00.00,  00.00,  00.00,  00.00,  00.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Oil, Conventional   ', 'barrels/dy',    0.00,   0.00,   0.00,   0.00,   0.00
                                         0.00,   0.00,   0.00,   0.00,   0.00
                                       100.00, 100.00, 100.00, 100.00, 100.00
                                       100.00, 100.00, 100.00, 100.00, 100.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Oil, Heavy          ', 'barrels/dy', .000438,.000438,.000438,.000438,.000438
                                      .000438,.000438,.000438,.000438,.000438
                                        90.00,  90.00,  90.00,  90.00,  90.00
                                        90.00,  90.00,  90.00,  90.00,  90.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Oil, Oil Sands      ', 'barrels/dy', .000256,.000256,.000256,.000256,.000256
                                      .000256,.000256,.000256,.000256,.000256
                                        90.00,  90.00,  90.00,  90.00,  90.00
                                        90.00,  90.00,  90.00,  90.00,  90.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Oil, Refining       ', 'barrels/dy', .000040,.000040,.000040,.000040,.000040
                                      .000040,.000040,.000040,.000040,.000040
                                        75.00,  75.00,  75.00,  75.00,  75.00
                                        75.00,  75.00,  75.00,  75.00,  75.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Uranium, mine (high)', 'tonnes/yr ', .000250,.000250,.000250,.000250,.000250
                                      .000250,.000250,.000250,.000250,.000250
                                        10.00,  10.00,  10.00,  10.00,  10.00
                                        10.00,  10.00,  10.00,  10.00,  10.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Uranium, mine (low)',  'tonnes/yr ', .000750,.000750,.000750,.000750,.000750
                                      .000750,.000750,.000750,.000750,.000750
                                        10.00,  10.00,  10.00,  10.00,  10.00
                                        10.00,  10.00,  10.00,  10.00,  10.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Uranium, refining   ', 'tonnes/yr ', .000000,.000000,.000000,.000000,.000000
                                      .000000,.000000,.000000,.000000,.000000
                                        00.00,  00.00,  00.00,  00.00,  00.00
                                        00.00,  00.00,  00.00,  00.00,  00.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Methanol, Coal      ', 'Mt/yr     ', .000000,.000000,.000000,.000000,.000000
                                      .000000,.000000,.000000,.000000,.000000
                                        00.00,  00.00,  00.00,  00.00,  00.00
                                        00.00,  00.00,  00.00,  00.00,  00.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
'Methanol, Natural Gas','          ', .000000,.000000,.000000,.000000,.000000
                                      .000000,.000000,.000000,.000000,.000000
                                        00.00,  00.00,  00.00,  00.00,  00.00
                                        00.00,  00.00,  00.00,  00.00,  00.00
                  8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33,8.33
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DATA SOURCES

[1] Domestic water use data: Environment Canada, Canada Water Year Books 1976, 1977-78, 1979-80.

[2] Livestock water use data: Prairie Provinces Water Board. Water Demand Study in the Saskatchewan-Nelson Basin, Appendix 3, Agricultural Water Uses, 1982 and Environment Canada, Canada Water Year Book, 1976.

[3] Crop data: Data determined from various sources. See Phase III Summary Report.

[4] Industrial data: Water Use Coefficients, Recirculation Factors and Consumption Percentages. See Appendix B, Phase II Summary Report. Final Demand Values. Statistics Canada, Canadian Statistical Review.

APPENDIX C2

DESCRIPTION OF DATA FILES

FILE 2
FORECAST DATA

C2 - FORECAST DATA FILE

File Name: FORECAST.DAT

```
descriptor (string)
Number of Years of Population Data (integer)

descriptor (string)
Number of Population Scenarios (integer)

Population Scenario Name (50-character string) ------------> repeat
                                                             > for
descriptor (string) -------------------------> repeat       > each
                                              > for          > population
Annual Urban Change* (real), No./1,000        > each         > scenario
Annual Rural Change* (real), No./1,000 ------> province     >

descriptor (string)
Number of Livestock Scenarios (integer)

Livestock Scenario Name (50-character string) ------------> repeat
                                                           > for each
descriptor (string) ----------------------> repeat for     > livestock
Annual Percentage Change** (real)----------> each province > scenario

descriptor (string)
Number of Industrial Scenarios (integer)

Industrial Scenario Name (50-character string) ----------->
Circulation Flag***(25-character string)                  > repeat
Final Year of Application**** (integer)                   > for each
Sector Number***** (integer)-----------------> repeat as  > industrial
Annual Percentage Change****** (real) -------> needed ---> scenario

9999
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* One for each year of population data.

** One for each animal type.

*** This flag defines whether or not the growths are to be 'circulated' through the inter- and intraregional matrices. This string must begin with 'Y' (e.g., 'Yes Circulation') for circulation; otherwise the default is no circulation.

**** Years must be listed in chronological order.

***** Sectors must be listed in sequential order.

****** One for each industrial region.

file: FORECAST.DAT

```
'No. of Years of Population Data',  25
'No. of Population Scenarios',       5
   'Stats Canada 1'
      'BC  ', 20.6,20.8,14.6,13.5,12.6,11.5,10.6, 9.9, 9.2, 8.5
               7.7, 7.0, 6.4, 5.7, 5.0, 4.6, 4.2, 3.9, 3.5, 3.2
               3.0, 2.7, 2.5, 2.3, 2.1
              20.6,20.8,14.6,13.5,12.6,11.5,10.6, 9.9, 9.2, 8.5
               7.7, 7.0, 6.4, 5.7, 5.0, 4.6, 4.2, 3.9, 3.5, 3.2
               3.0, 2.7, 2.5, 2.3, 2.1
      'Albt', 43.0,42.9,-2.8,-1.8,-0.8, 1.1, 2.5, 3.1, 4.0, 4.8
               5.5, 5.8, 6.1, 6.4, 6.5, 6.1, 5.7, 5.4, 5.1, 4.9
               4.6, 4.4, 4.2, 3.9, 3.7
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               5.9, 5.7, 5.6, 5.4, 5.3
      'Man ',  7.8, 7.9, 8.8, 9.5,10.3,10.1, 9.8, 8.3, 7.2, 5.9
               4.8, 3.6, 2.5, 1.5, 0.5, 0.1,-0.2,-0.4,-0.7,-0.9
              -1.1,-1.3,-1.4,-1.6,-1.7
               7.8, 7.9, 8.8, 9.5,10.3,10.1, 9.8, 8.3, 7.2, 5.9
               4.8, 3.6, 2.5, 1.5, 0.5, 0.1,-0.2,-0.4,-0.7,-0.9
              -1.1,-1.3,-1.4,-1.6,-1.7
   'Stats Canada 2'
      'BC  ', 20.6,20.8,14.6,15.0,15.5,15.3,16.0,17.4,17.4,17.9
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              43.0,42.9, 4.0, 8.2,10.7,14.0,17.9,20.2,19.9,18.6
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              10.4, 9.9, 9.5, 9.1, 8.7
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              -0.8,-0.9,-1.0,-1.0,-1.1
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              -0.8,-0.9,-1.0,-1.0,-1.1
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              18.6,18.0,17.0,15.9,14.8,14.4,13.9,13.4,13.0,12.6
              12.2,11.9,11.6,11.3,11.1
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              20.1,19.1,18.4,17.5,16.8,16.1,15.4,14.7,14.1,13.5
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   'Albt', 43.0,42.9,-2.4,-1.0, 0.3, 2.7, 4.5, 5.8, 7.0, 8.1
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           13.3,13.1,12.8,12.6,12.2,11.9,11.5,11.2,10.9,10.6
           10.4,10.2,10.0, 9.9, 9.8
   'Man ',  7.8, 7.9, 9.1,10.2,11.3,11.5,11.6,10.6, 9.8, 9.0
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           18.4,18.2,17.9,17.6,17.2,16.8,16.1,15.5,15.0,14.5
           14.0,13.6,13.2,12.9,12.6
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           13.2,13.3,13.2,13.2,13.0,12.9,12.5,12.2,11.9,11.6
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           11.5,11.8,12.0,12.2,12.2,12.1,11.6,11.2,10.9,10.5
           10.2,10.0, 9.8, 9.6, 9.5
'No. of Livestock Scenarios', 3
   'low'
     'BC  ',  0.65,-0.48, 0.07,-2.99,-1.97, 0.34
     'Albt',  1.02,-1.67,-1.07,-1.45,-2.05,-1.21
     'Sask',  0.91,-1.71,-0.78,-0.98,-2.41,-1.63
     'Man ',  0.10,-2.67,-0.92, 0.28,-1.85,-0.68
   'expected'
     'BC  ',  1.55, 0.32, 1.20,-2.27,-0.50, 1.15
     'Albt',  1.92, 0.00, 0.08,-0.40,-0.83, 0.60
     'Sask',  1.82,-0.51,-0.40, 0.22,-1.00,-0.59
     'Man ',  1.06,-0.57,-0.21, 1.72,-0.78, 0.00
   'high'
     'BC  ',  2.44, 0.83, 2.13, 1.59, 0.89, 1.68
     'Albt',  2.84, 1.56, 0.49, 1.45, 1.10, 0.33
     'Sask',  2.73, 0.87, 0.40, 2.55, 0.00, 0.63
     'Man ',  2.56, 2.08, 0.53, 3.23, 0.21, 0.97
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'No. of Industrial Scenarios', 1
    'Informetrica Limited', 'No Cascading'
    1986
     1   1.1   2.0   7.4   7.1  -1.1   1.6   0.5   0.3   3.9   6.7
     2  -1.2   5.7  16.5   2.6   2.9   3.9   8.0   5.3   0.0   1.2
     3   1.8   0.0  12.9  -0.3  -1.6  -5.0   0.9 278.5   0.0  -5.5
     4   0.4  -0.9   3.8   6.5   5.7   0.0 -12.8  11.9   0.0  23.1
     5  -0.8  14.4  -0.2   7.5   1.7  -9.3  14.6   5.9  -7.8  -4.7
     6   3.6   0.7   1.2   1.4   1.2  -1.5   3.3  -0.4  -3.7   9.6
     7   0.0   0.0   0.0   0.0  -2.7  -3.1   0.0   0.0   0.0   0.0
     8   6.3  -1.0   5.6   5.4   3.2   6.3  22.3   4.1   3.3   0.0
     9  -0.4   0.5  15.2  -3.4   0.1  -1.7   8.7   1.8   0.9  14.6
    10   8.0  -1.7   4.9  11.6   3.4  -1.6   2.8   1.0  -9.6   3.6
    11  -0.7   0.0   3.9  -0.4   5.3   2.2   1.9  -0.4  -0.7   2.3
    12   2.0  -5.5   2.8  -1.5   2.9   0.8 -10.0   7.2   0.0   3.8
    13  -1.3   2.0 -11.1  -0.9   3.2   3.1  -2.3  -0.4   0.0  -5.1
    14   0.9   2.8   0.1   1.5   3.4   3.3  -0.5   3.0   5.2   2.8
    15  -6.0  -3.7  -1.6  -0.3   0.3   2.8  10.6  -6.6   0.0   0.0
    16  -6.0  -3.7  -1.6  -0.3   0.3   2.8  10.6  -6.6   0.0   0.0
    17  -4.0  -5.4  -1.5  -6.3  -0.5  -2.5   3.0  -1.4  10.7  -7.9
    18  -6.8   0.4  -1.4  -7.5   0.3  -2.9  -1.2  -9.7  13.1   5.0
    19 -11.7   2.0  16.3   9.8   7.3  -3.0   6.1 -11.4 -21.5 -17.7
    20  -2.6   6.0  -1.2  -3.7   1.4   1.2 -14.5   2.0   1.7  10.4
    21  -4.2  -8.4  -7.3  -0.7   3.2   2.8   0.7   1.0   8.2  -0.1
    22   4.0   5.2  -9.9   0.0  -0.3 -11.1 -12.2  -4.3   0.0   0.0
    23  -0.3   2.9   3.4  -2.5   2.1   2.3   1.5 -13.1  17.7 -11.3
    24   3.8   0.6  -4.9   2.1  -3.4   2.9 -13.2   5.7  60.2   1.5
    25  -4.6  -8.0  -3.1   4.3   3.7   2.1  -1.5   2.8   0.8   2.6
    26   2.8  -0.1   2.9   3.3   3.2   0.0   5.1   3.7   0.0   1.4
    27   2.9   5.3   3.2   2.9   3.1   4.1   6.9   2.3   2.9   3.0
    28   2.9   5.3   3.2   2.9   3.1   4.1   6.9   2.3   2.9   3.0
    29   1.7   1.8   2.3   4.5   4.8   3.3   0.8   4.3   1.9   2.9
    30   2.6   2.3   3.3   1.4   3.8   2.6   2.8   2.0   2.1   1.5
    1991
     1   2.7   1.1   0.9   1.1   2.3   2.6   1.7   1.5   1.5   1.8
     2   2.1   3.5   3.5   3.5   3.5   3.5   3.0   2.5   3.0   3.0
     3   3.6   3.4   2.7   3.4   3.0   1.2   5.0   5.4   0.0   0.2
     4   8.0   1.8   2.7   2.8   1.9   0.0   1.9 -22.5   0.0  -1.2
     5   3.4   5.6   4.2   7.6  -1.1   8.4  14.5 -12.2  -9.6   6.3
     6   2.0   4.0   2.6   0.9   2.4   2.7   1.5   1.7   2.4   1.0
     7   0.0   0.0   0.0   0.0  -1.0  -0.6   0.0   0.0   0.0   0.0
     8   3.3   3.3   3.3   3.3   3.9   3.3   3.3   3.3   3.3   3.3
     9   0.9   0.9   0.9   0.9   0.3   1.9   0.9   0.9   0.9   0.9
    10   3.2   3.2   3.2   2.5   3.4   3.4   3.2   3.2   3.2   3.2
    11   2.0   0.4   1.7   1.1   0.7   1.4   2.5   1.2   1.3   1.4
    12   0.4   2.8   3.3   2.8   3.2   3.7   3.6   3.6   0.0   3.7
    13   3.1   3.7   4.1   3.2   2.5   3.1   2.5   1.7   0.0   2.5
    14   2.4   1.4   2.4   2.5   2.6   2.4   2.7   2.4   2.4   2.4
    15  -0.4   5.0   3.8   3.8   3.6   5.3   3.8   3.8   0.0   0.0
    16  -0.4   5.0   3.8   3.8   3.6   5.3   3.8   3.8   0.0   0.0
    17   5.6   3.1   4.3   5.1   3.6   4.8   4.4   3.3   3.5   2.4
    18   3.6   4.4   1.9  -3.6   5.2   5.4   5.1   6.0   5.1   6.0
    19   3.3   2.9   2.5   3.7   3.3   5.2  12.8   9.4   0.3   5.0
    20   2.4   4.0   4.0   4.0   4.2   3.9   4.9   4.9   4.9   4.9
    21   1.0   5.1   4.0   4.3   4.2   5.1   4.5   4.2   4.5   4.5
    22   1.8   0.8   3.9   0.0   4.6   3.6   4.1   3.6   0.0   0.0
    23   1.2   3.2   2.5   1.1   1.9   1.7   1.3   1.3   1.3   1.3
    24   3.5   3.2   3.7   3.6   3.6   3.7   3.7   3.8   4.1   3.7
    25  -0.4   4.1   3.7   3.0   1.9   4.1   2.8  -1.0  -3.9   4.0
    26   1.6   2.1   2.5   2.1   2.6   2.4   2.4   1.4   0.8   1.5
    27   2.1   2.0   2.6   5.1   2.7   3.4   3.0   2.9   3.2   2.7
    28   2.1   2.0   2.6   5.1   2.7   3.4   3.0   2.9   3.2   2.7
    29   1.9   1.3   2.4   1.8   3.2   2.9   2.1   2.3   2.7   2.7
    30   1.4   2.0   2.1   1.9   2.8   2.5   2.3   2.5   2.1   2.1
    1996
     1   2.3   2.4   2.4   2.4   2.3   2.3   1.1   0.6   1.2   0.5
     2   1.7   2.4   2.4   2.4   2.4   2.4   1.9  -0.4   1.9   1.9
     3   2.8   2.3   2.1   2.0   2.1   2.7   2.9   2.3   0.0   2.2
     4   3.5   2.6   0.5   2.3   2.1   0.0   2.1 -25.3   0.0 147.5
     5   3.1   2.6   3.5   2.7   2.4   0.7   5.2  -3.2   1.1   2.8
     6   2.2   2.2   2.2   2.2   2.2   2.2   2.5   2.4   2.2   1.9
     7   0.0   0.0   0.0   0.0   1.1   1.1   0.0   0.0   0.0   0.0
     8   2.7   2.7   2.7   2.7   2.7   2.7   2.7   2.7   2.7   2.7
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   9    2.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1
  10    2.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1
  11    2.0    1.7    1.7    1.7    1.7    1.7    1.8    1.7    1.7    1.7
  12    2.7    2.7    2.7    2.7    2.7    2.7    2.7    2.7    0.0    2.7
  13    2.7    2.5    2.6    2.5    2.5    2.6    1.9    1.5    0.0    1.4
  14    2.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1
  15    2.0    3.5    2.6    2.6    2.5    2.7    2.6    2.6    0.0    0.0
  16    2.0    3.5    2.6    2.6    2.5    2.7    2.6    2.6    0.0    0.0
  17    2.8    4.7    2.8    3.4    2.9    2.5    2.6    2.3    2.7    3.3
  18    2.6    5.5    2.6    3.4    2.6    2.6    2.6    2.6    2.6    2.6
  19    4.3    5.8    6.5    5.4    3.7    2.9  -12.4    4.8    3.1   14.1
  20    3.1    3.1    3.1    3.1    3.1    3.1    3.1    3.1    3.1    3.1
  21    2.7    5.0    4.1    4.6    3.2    1.5    3.6    3.6    3.6    3.6
  22    1.5    2.7    2.1    0.0    2.2   -0.3    1.6    1.6    0.0   -0.3
  23    2.1    4.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1    2.1
  24    2.5    2.5    2.5    2.5    2.5    2.5    2.5    2.5    2.5    2.5
  25    2.3    5.4    4.1    5.3    2.3    1.5    0.2    0.4    1.8    6.2
  26    2.6    3.0    2.8    2.5    2.6    2.4    2.3    2.3    2.3    4.2
  27    1.6    1.2    1.6    3.1    1.8    2.9    2.0    1.1    1.5    1.6
  28    1.6    1.2    1.6    3.1    1.8    2.9    2.0    1.1    1.5    1.6
  29    1.7    2.7    2.1    1.6    2.1    1.9    1.2    1.6    1.5    3.8
  30    1.3    2.5    2.3    1.4    2.2    1.9    1.1    1.8    1.7    3.0
2099
   1    2.3    2.3    2.4    2.4    2.3    2.3    1.1    0.5    1.2    0.5
   2    2.2    1.6    1.6    1.6    1.6    1.6    0.3    0.0    1.1    0.6
   3    1.7    1.1    0.8    0.5    0.6    1.6    1.3    1.1    0.0    1.3
   4    6.8    0.6   -1.1    0.6    0.2    0.0    0.2   -2.4    0.0   -0.1
   5    0.7    2.8    3.6   -2.8    2.5    2.3    2.2    2.2   -0.7   -0.7
   6    2.0    2.0    2.0    2.0    2.0    2.0    2.0    2.8    2.0    2.3
   7    0.0    0.0    0.0    0.0    2.9    2.9    0.0    0.0    0.0    0.0
   8    2.2    2.2    2.2    2.2    2.2    2.2    2.2    2.2    2.2    2.2
   9    2.4    2.4    2.4    2.4    2.4    2.4    2.4    2.4    2.4    2.4
  10    1.1    1.1    1.1    1.1    1.1    1.1    1.1    1.1    1.1    1.1
  11    2.4    2.2    2.2    2.2    2.2    2.2    0.2    2.2    2.2    2.2
  12    2.4    2.4    2.4    2.4    2.4    2.4    2.4    2.4    0.0    2.4
  13    2.0    1.9    2.0    1.9    1.9    2.0    1.4    1.1    0.0    1.1
  14    1.6    1.6    1.6    1.6    1.6    1.6    1.6    1.6    1.6    1.6
  15    1.7    3.6    2.5    2.5    2.7    2.3    2.5    2.5    0.0    0.0
  16    1.7    3.6    2.5    2.5    2.7    2.3    2.5    2.5    0.0    0.0
  17    2.2    3.8    2.5    2.5    2.3    2.0    2.0    1.9    2.0    1.6
  18    1.4    4.9    1.4    4.1    1.4    1.4    1.4    1.4    1.4    1.4
  19    2.0    2.1    1.9    2.5    3.7    2.6    1.5    2.1    0.3   -3.4
  20    1.6    1.6    1.6    1.6    1.6    1.6    1.6    1.6    1.6    1.6
  21    1.4    3.5    4.5    3.4    2.6    2.0    2.8    2.8    2.8    2.8
  22    1.4    2.3    2.4    0.0    1.9   -0.1    1.7    1.9    0.0   -0.1
  23    1.6    4.0    1.6    1.6    1.6    1.6    1.6    1.6    1.6    1.6
  24    1.7    1.7    1.7    1.7    1.7    1.7    1.7    1.7    1.7    1.7
  25    2.0    4.0    5.1    4.6    2.6    1.9    3.0    1.5    1.6    0.4
  26    2.0    2.1    2.3    1.9    2.0    1.8    2.1    1.9    1.6    1.4
  27    1.4    0.9    1.8    3.1    1.8    1.8    1.8    1.4    1.1    1.3
  28    1.4    0.9    1.8    3.1    1.8    1.8    1.8    1.4    1.1    1.3
  29    1.6    2.1    2.2    1.5    1.8    1.5    1.5    1.6    1.4    1.1
  30    1.3    2.1    2.3    1.5    1.5    1.3    1.4    1.6    1.7    1.2
9999
```

APPENDIX C3

DESCRIPTION OF DATA FILES

FILE 3
GAUGE DATA

C3 - GAUGE DETAIL DATA FILE

File Name: Gxxxxxxx.DAT

```
descriptor (string)
Gauge Name (25-character string)

descriptor (string)
Province Number (integer)

descriptor (string)

Cutback Increments* (real) ---------------------------> repeat for
                                                         each category
descriptor (string)
Upper Limit on Groundwater (real), Mm^3/month

descriptor (string)
Urban Population (integer)

Water Intake (real), L/d/capita ----------------------> repeat for
Consumption Percentage (real)                         > each urban
Monthly Distribution Factor** (real)                  > usage
                                                      >
Fraction of Intake from Groundwater*** (real) -------->

descriptor (string)
Rural Population (integer)

Water Intake (real), L/d/capita ----------------------> repeat for
Consumption Percentage (real)                         > each rural
Monthly Distribution Factor**** (real)                > usage
                                                      >
Fraction of Intake from Groundwater*** (real) -------->

descriptor (string)

Number of Animals (integer), in thousands ------------> repeat for
Water Intake (real), L/d/head                         > each animal
Consumption Percentage (real) ------------------------> type
```

---

* The values for each cutback increment (which must sum to 1.00 but may include zeros).

** One factor for each month (which must sum to 12).

*** One value for each month, and must be included even if groundwater is not being considered. Default is zero, maximum is 1.0.

**** One factor for each month (which must sum to 12).

Fraction of Intake from Groundwater* (real)

descriptor (string)

Sector Number** (integer) ------------------------------> repeat
Water Intake (real), Mm^3/year   > for each
Consumption Percentage (real)   > sector
Fraction of Intake from Groundwater* (real) ----------->

descriptor (string)
Reservoir Name (25-character string)***

descriptor (string)
Full Supply Level (real), m

descriptor (string)
Evaluation Level**** (real), m

descriptor (string)
Upper Rule Curve Level***** (real), m

descriptor (string)
Evaluation Level****

descriptor (string)
Lower Rule Curve Level***** (real), m

descriptor (string)
Evaluation Level (real),**** m

descriptor (string)
Minimum Supply Level (real), m

---

* One value for each month, and must be included even if groundwater is not being considered. Default is zero, maximum is 1.0.

** Must be in consecutive order. Note: because of the existence of the irrigation and electrical energy submodels, the information included here for Sector 1 (agriculture) and Sector 27 (electric power) is used only for cascading purposes.

*** Or 'NONE' to indicate no reservoir data (then proceeding to 'Number of Scenarios' input).

**** One value for each month. If values are all zero, then program will automatically calculate this value as the average of the two other levels above and below it.

*****One value for each month.

descriptor (string)
Maximum No-Damage Release* (real), m^3/s

descriptor (string)
Evaluation Outflow** (real), m^3/s

descriptor (string)
Target Outflow* (real), m^3/s

descriptor (string)
Evaluation Outflow*** (real), m^3/s

descriptor (string)
Minimum Riparian Release* (real), m^3/s

descriptor (string)
Number of Stage Points (integer)

descriptor (string)
Stage Elevation*** (real), m

descriptor (string)
Storage Volume* (real), Mm^3

descriptor (string)
Surface Area* (real), km^2

descriptor (string)
Number of Development Scenarios (integer)

descriptor (string) ---------------------------------- > repeat
Development Year (integer) > for
> each
descriptor (string) > scenario
Development Name (50-character string) >
descriptor (string) >

---

* One value for each month.

** One value for each month. If values are all zero, then program will automatically calculate this value as the average of the two other levels above and below it.

***One value for each stage point.

```
Number of Diversions (integer)                              >
                                                            >
Diversion Name (25-character string) -------> repeat       >
Annual Volume* (real), Mm^3                  > for each     >
Monthly Distribution (real), % ------------> diversion>
                                                            >
descriptor (string)                                         >
Number of Minimum Flows (integer)                           >
                                                            >
Minimum Flow Name (25-character string) ----> repeat        >
Monthly Minimum   (real), m^3/s ------------> for each      >
                                              flow          >
                                                            >
descriptor (string)                                         >
Number of Energy Projects (integer)                         >
                                                            >
Project Name (25-character string) ---------->              > repeat
Project Index (integer)                      >              > for
Capacity (real)                              > repeat       > each
Water Use Coefficient (real), Mm^3/yr/unit   > for          > scenario
Consumption Percentage (real), %             > each         >
Monthly Distribution** (real), %             > project      >
                                             >              >
Fraction from Groundwater*** (real)          >              >

Monthly Off-Stream Storage**** (real), % ----> -------->
```

---

* Positive means inflow; negative means outflow.

** One percentage for each month (which must sum to 100).

*** One value for each month. Default is zero, maximum is 1.0.

****One percentage for each month (which must either be zero or sum to 100).

file: GRSRVR01.DAT

```
'Gauge Name'    'Reservoir No. 1'
'Province I.D.'  2
'Cutback Increments'
                   -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                   -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                   -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                   -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
'Groundwater Limit' -99.
'Urban Population', 0
                -99,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                             0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
'Rural Population', 0
                -99,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                             0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
'Livestock'
            0,  -99,  -99
            0,  -99,  -99
            0,  -99,  -99
            0,  -99,  -99
            0,  -99,  -99
            0,  -99,  -99
                            0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
'Industry'
          1,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          2,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          3,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          4,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          5,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          6,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          7,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          8,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          9,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         10,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         11,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         12,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         13,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         14,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         15,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         16,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         17,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         18,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         19,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         20,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         21,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         22,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         23,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         24,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         25,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         26,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         27,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         28,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         29,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         30,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.

'Reservoir'           'Reservoir No. 1'

'Full Supply Level   '  951.0
'Evaluation Level '       0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
'Upper Rule Curve '     948.0 948.0 948.0 948.0 948.0 948.0 948.0 948.0 948.0 948.0 948.0 948.0
'Evaluation Level '       0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
'Lower Rule Curve '     940.0 935.0 930.0 930.0 935.0 940.0 945.0 945.0 945.0 945.0 945.0 945.0
'Evaluation Level '       0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
'Minimum Supply Level'  926.0
'Maximum Release  '     500.0 500.0 500.0 500.0 500.0 500.0 500.0 500.0 500.0 500.0 500.0 500.0
'Evaluation Outflow '     0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
'Target Outflow   '      16.0  16.0  16.0  16.0  16.0  16.0  16.0  16.0  16.0  16.0  16.0  16.0
'Evaluation Outflow '     0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
'Minimum Release  '      16.0  16.0  16.0  16.0  16.0  16.0  16.0  16.0  16.0  16.0  16.0  16.0
'No. of Stage Points '    7
'Stage Elevation  '     924.0 929.0 934.0 939.0 944.0 948.0 951.0
```

```
'Storage Volume    '      10.0  25.0  52.0  90.0 145.0 210.0 260.0
'Surface Area      '       2.7   4.3   6.5   9.6  13.2  17.7  19.2

'No. of Scenarios',        1

'Development Year',        1987
'Description',             '1987 - Test Case Scneario'
'No. of Diversions',       0
'No. of Minimum Flows',    0
'No. of Energy Projects'   0
```

```
file:  GNODE_02.DAT


'Gauge Name',   'Node 2'
'Province I.D.', 2
'Cutback Increments'
                        -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                        -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                        -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                        -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
'Groundwater Limit' -99.
'Urban Population', 68242
                426,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19
'Rural Population', 31818
                -99,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90
'Livestock'
                342,  -99,  -99
                 14,  -99,  -99
                 12,  -99,  -99
                 99,  -99,  -99
                 19,  -99,  -99
                175,  -99,  -99
                                  0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9
'Industry'
             1  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             2  0.0011    75.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             3  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             4  1.1568    56.1    1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
             5  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             6  0.4037     5.3   .003 .003 .003 .003 .003 .003 .003 .003 .003 .003 .003 .003
             7  0.0000    24.2   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
             8  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             9  0.0019     0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            10  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            11  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            12  0.0067     0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            13  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            14  0.0048     2.9   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            15  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            16  0.0000     4.4   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            17  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            18  0.0478     3.4   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            19  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            20  0.0988     3.3   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            21  0.0947    45.4    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            22  0.0109    57.2    1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
            23  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            24  0.0181     8.6   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            25  0.0000     0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            26  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            27  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            28  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            29  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            30  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.

'Reservoir'             'None'

'No. of Scenarios',      1

'Development Year',      1987
'Description',          '1987 - Test Case Scenario'
'No. of Diversions',     0
'No. of Minimum Flows'   0
'No. of Energy Projects' 0
```

file: GNODE_03.DAT

```
'Gauge Name'    'Node 3'
'Province I.D.'  2
'Cutback Increments'
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
'Groundwater Limit' -99.
'Urban Population', 12918
                    352,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                    0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34
'Rural Population', 24824
                    -99,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                    0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90
'Livestock'
              236,  -99,  -99
               10,  -99,  -99
                5,  -99,  -99
              120,  -99,  -99
                5,  -99,  -99
             1044,  -99,  -99
                                  0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9
'Industry'
           1   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
           2   0.0001    75.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
           3   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
           4   0.2623    31.3     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
           5   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
           6   0.0008     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
           7   0.0000    24.2    .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
           8   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
           9   0.0000     0.0    .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
          10   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          11   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          12   0.0032     0.0    .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
          13   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          14   0.0013     2.9    .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
          15   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          16   0.0000     4.4    .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
          17   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          18   0.0083     3.4    .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
          19   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          20   0.0000     3.3    .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
          21   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          22   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          23   2.0137    85.3     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          24   0.0052     8.6    .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
          25   0.0000     0.0    .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
          26   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          27   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          28   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          29   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          30   0.0000     0.0     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.

'Reservoir'                'None'

'No. of Scenarios'          1

'Development Year'          1987
'Description'              '1987 - Test Case Scenario'
'No. of Diversions'         1
'Diversion No. 1'         -37.0  0.0,0.0,0.0,14.29,14.29,14.29,14.29,14.29,14.29,14.29,0.0,0.0
'No. of Minimum Flows'     0
'No. of Energy Projects'   0
```

file: GNODE_04.DAT

```
'Gauge Name'     'Node 4'
'Province I.D.'  2
'Cutback Increments'
                         -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                         -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                         -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                         -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
'Groundwater Limit' -99.
'Urban Population', 9260
                    293,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                    0.44 0.44 0.44 0.44 0.44 0.44 0.44 0.44 0.44 0.44 0.44 0.44
'Rural Population', 10018
                    -99,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                    0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90
'Livestock'
                76,  -99,  -99
                 3,  -99,  -99
                 2,  -99,  -99
                40,  -99,  -99
                 2,  -99,  -99
               257,  -99,  -99
                                 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9
'Industry'
             1   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             2   0.0000   75.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             3   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             4   0.1195   37.9    .328 .328 .328 .328 .328 .328 .328 .328 .328 .328 .328 .328
             5   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             6   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             7   0.0000   24.2   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
             8   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             9   0.0019    0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            10   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            11   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            12   0.0000    0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            13   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            14   0.0002    2.9   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            15   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            16   0.0000    4.4   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            17   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            18   0.0083    3.4   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            19   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            20   0.0000    3.3   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            21   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            22   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            23   2.0137   85.3    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            24   0.0000    8.6   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            25   0.0000    0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            26   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            27   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            28   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            29   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            30   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.

'Reservoir'               'None'

'No. of Scenarios'         1

'Development Year'         1987
'Description'             '1987 - Committed Scenario'
'No. of Diversions'        0
'No. of Minimum Flows'     0
'No. of Energy Projects'   0
```

```
file:  GNODE_05.DAT

'Gauge Name'    'Node 5'
'Province I.D.'  2
'Cutback Increments'
                     -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                     -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                     -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                     -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
'Groundwater Limit' -99.
'Urban Population', 0
                     483,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
'Rural Population', 920
                     -99,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                     0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90
'Livestock'
                 36, -99,  -99
                  2, -99,  -99
                  1, -99,  -99
                  0, -99,  -99
                  0, -99,  -99
                  6, -99,  -99
                                 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9
'Industry'
             1  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             2  0.0000    75.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             3  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             4  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             5  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             6  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             7  0.0000    24.2   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
             8  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             9  0.0000     0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            10  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            11  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            12  0.0000     0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            13  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            14  0.0000     2.9   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            15  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            16  0.0000     4.4   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            17  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            18  0.0000     3.4   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            19  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            20  0.0000     3.3   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            21  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            22  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            23  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            24  0.0000     8.6   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            25  0.0000     0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            26  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            27  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            28  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            29  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            30  0.0000     0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.

'Reservoir'               'None'

'No. of Scenarios'         1

'Development Year'         1987
'Description'             '1987 - Test Case Scenario'
'No. of Diversions'        2
'Diversion No. 2'          38.0  0.0,0.0,0.0,0.0,15.0,20.0,25.0,25.0,15.0,0.0,0.0,0.0
'Diversion No. 3'          15.0  0.0,0.0,0.0,0.0,25.0,25.0,25.0,25.0,0.0,0.0,0.0,0.0
'No. of Minimum Flows',    0
'No. of Energy Projects'   1
'Thermal Coal'             1  3.3 -99 -99  8.33 8.33 8.33 8.33 8.33 8.33 8.33 8.33 8.33 8.33 8.33 8.33
                                           0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
                                           0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
```

file: GNODE_06.DAT

```
'Gauge Name'     'Node 6'
'Province I.D.'  2
'Cutback Increments'
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
'Groundwater Limit' -99.
'Urban Population', 2806
                    674,  -99,  -99, -99, -99, -99, -99, -99, -99, -99, -99, -99, -99, -99
                                0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.54
    'Rural Population', 10784
                    -99,  -99,  -99, -99, -99, -99, -99, -99, -99, -99, -99, -99, -99, -99
                                0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90
'Livestock'
               183,  -99,  -99
                 8,  -99,  -99
                 4,  -99,  -99
                31,  -99,  -99
                 4,  -99,  -99
               147,  -99,  -99
                                  0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9
'Industry'
             1   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             2   0.0000   75.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             3   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             4   2.0119   89.4    .832 .832 .832 .832 .832 .832 .832 .832 .832 .832 .832 .832
             5   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             6   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             7   0.0000   24.2   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
             8   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
             9   0.0000    0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            10   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            11   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            12   0.0000    0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            13   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            14   0.0005    2.9   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            15   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            16   0.0000    4.4   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            17   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            18   0.0000    3.4   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            19   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            20   0.0000    3.3   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            21   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            22   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            23   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            24   0.0000    8.6   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            25   0.0000    0.0   .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03 .03
            26   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            27   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            28   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            29   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
            30   0.0000    0.0    0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.

'Reservoir'              'None'

'No. of Scenarios'        1

'Development Year'        1987
'Description'            '1987 - Test Case Scenario'
'No. of Diversions'       2
'Diversion No. 2'        -38.0  0.0,0.0,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,0.0,0.0
'Diversion No. 3'        -15.0  0.0,0.0,0.0,0.0,25.0,25.0,25.0,25.0,0.0,0.0,0.0,0.0
'No. of Minimum Flows'    0
'No. of Energy Projects'  0
```

file: GBNDRY07.DAT

```
'Gauge Name'    'Boundary Node 7'
'Province I.D.'  2
'Cutback Increments'
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
'Groundwater Limit' -99.
'Urban Population', 0
                    -99,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                                 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
'Rural Population', 0
                    -99,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                                 0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
'Livestock'
               0,  -99,  -99
               0,  -99,  -99
               0,  -99,  -99
               0,  -99,  -99
               0,  -99,  -99
               0,  -99,  -99
                            0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
'Industry'
          1,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          2,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          3,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          4,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          5,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          6,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          7,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          8,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          9,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         10,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         11,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         12,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         13,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         14,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         15,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         16,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         17,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         18,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         19,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         20,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         21,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         22,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         23,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         24,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         25,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         26,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         27,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         28,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         29,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         30,  0.00,  -99     0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.

'Reservoir'              'None'

'No. of Scenarios'        1

'Development Year'        1987
'Description'            '1987 - Test Case Scenario'
'No. of Diversions'       0
'No. of Minimum Flows'    0
'No. of Energy Projects'  0
```

```
file:  GDUMMY08.DAT

'Gauge Name'    'Dummy Node 8'
'Province I.D.'  4
'Cutback Increments'
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
                    -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.  -99.
'Groundwater Limit' -99.
'Urban Population', 0
                    -99,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
'Rural Population', 0
                    -99,  -99,  -99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99,-99
                                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
'Livestock'
                0,  -99,  -99
                0,  -99,  -99
                0,  -99,  -99
                0,  -99,  -99
                0,  -99,  -99
                0,  -99,  -99
                                 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
'Industry'
          1,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          2,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          3,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          4,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          5,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          6,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          7,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          8,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
          9,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         10,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         11,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         12,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         13,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         14,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         15,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         16,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         17,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         18,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         19,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         20,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         21,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         22,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         23,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         24,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         25,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         26,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         27,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         28,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         29,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.
         30,  0.00,  -99                  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.  0.

'Reservoir'              'None'

'No. of Scenarios'        1

'Development Year'       1987
'Description'            '1987 - Test Case Scenario'
'No. of Diversions'       0
'No. of Minimum Flows'    0
'No. of Energy Projects'  0
```

APPENDIX C4

DESCRIPTION OF DATA FILES

FILE 4
GAUGE HYDROLOGY

C4 - GAUGE HYDROLOGY FILE

File Name: Hxxxxxxx.DAT

Number of Years (integer)

Year* (integer) --------------------------------------> repeat for
Streamflow** (integer), m^3/s ------------------------> each year

9999

---

* Years must be in sequential order; there cannot be gaps.

**One value for each month.

file: HRSRVR01.DAT

```
  10
1912     3.28     3.71     6.85    26.16    53.92    53.92   137.62    67.96    61.82    36.27    17.58     8.10
1913     5.66     5.38     5.58    53.01    55.93    67.45    71.50    44.77    24.35    16.68    11.24     4.45
1914     3.77     4.05     5.18    12.29    26.02    50.04    32.05    17.84    14.95    19.62    10.68     4.45
1915     3.77     3.68     8.24    17.05    60.77   167.86   228.43   110.72    53.92    40.01    16.28     7.08
1916     5.66     5.10    11.30    28.86    48.87   158.04   114.29   102.31    98.43    46.52    24.98    11.50
1917     8.33     6.48     6.82    56.97   123.60   121.51    50.29    28.29    25.15    19.94    14.38     5.52
1918     6.20     5.24    19.23    38.79    25.88    48.90    25.29    24.13    18.18    13.28     7.08     3.74
1919     4.67     3.68     3.34    21.27    28.18    24.92    18.77    27.16    15.74     9.00     4.98     2.86
1920     3.00     3.03     3.94    42.19   125.02    47.15    60.31    22.51    11.16     7.65     4.05     2.69
1921     2.78     2.38     2.44    32.99    35.96    35.99    24.78    17.87     9.49     7.56     4.16     2.29
9999
```

file: HNODE_02.DAT

```
  10
1912     6.82     7.76    14.27    54.34   111.96   111.94   285.75   141.13   128.33    75.32    36.53    16.85
1913    11.81    11.21    11.61   110.07   116.13   140.06   148.44    92.99    50.60    34.63    23.36     9.26
1914     7.87     8.44    10.76    25.54    54.03   103.89    66.57    37.07    31.09    40.75    22.17     9.29
1915     7.87     7.67    17.16    35.42   126.21   348.52   474.25   229.88   111.96    83.08    33.84    14.72
1916    11.78    10.62    23.47    60.00   101.49   328.11   237.30   212.43   204.39    96.59    51.88    23.87
1917    17.30    13.51    14.19   118.31   256.64   252.27   104.40    58.73    52.24    41.40    29.90    11.47
1918    12.88    10.93    39.93    80.56    53.75   101.57    52.53    50.12    37.77    27.58    14.72     7.79
1919     9.71     7.67     6.99    44.17    58.50    51.73    38.99    56.38    32.71    18.75    10.36     5.97
1920     6.26     6.34     8.21    87.61   259.58    97.92   125.22    46.78    23.16    15.91     8.41     5.61
1921     5.78     4.96     5.07    68.53    74.67    74.73    51.48    37.12    19.74    15.74     8.69     4.81
9999
```

file: HNODE_03.DAT

```
  10
1912     6.14     7.08    14.22    76.65   111.51   111.43   321.91   152.15   140.54    77.70    40.27    18.04
1913    10.90    10.42    11.78   136.80   111.34   140.56   160.19    97.41    55.78    38.37    26.16     9.66
1914     7.42     7.70    12.12    31.18    55.95   103.89    69.63    40.12    35.08    46.07    25.74     9.68
1915     7.59     6.99    18.60    54.57   132.32   347.90   565.91   248.71   124.03    88.69    36.93    15.74
1916    11.52     9.91    52.56    95.91   100.07   331.39   274.70   223.14   231.66   102.59    55.90    26.28
1917    18.21    13.05    14.92   148.24   269.41   256.41   112.90    62.81    57.40    40.38    30.70    11.81
1918    12.71    11.47    53.52    93.19    53.01    93.98    50.74    45.36    35.93    29.22    17.70     8.18
1919     8.30     7.02     7.50    67.79    68.56    49.21    35.57    58.45    36.84    18.12    10.51     6.74
1920     7.14     8.13     9.49   137.22   316.75   106.84   136.88    50.21    27.24    17.95     9.68     5.86
1921     5.07     5.13     7.25    95.20    74.05    67.90    48.28    35.99    20.61    13.22     8.83     4.53
9999
```

file: HNODE_04.DAT

```
  10
1912    0.00    0.00    0.00    6.03    0.00    0.00    9.77    2.97    3.31    0.65    1.02    0.31
1913    0.00    0.00    0.06    7.22    0.00    0.14    3.17    1.19    1.42    1.02    0.76    0.11
1914    0.00    0.00    0.37    1.53    0.51    0.00    0.82    0.82    1.08    1.44    0.96    0.11
1915    0.00    0.00    0.40    5.18    1.64    0.00   24.81    5.10    3.26    1.53    0.82    0.28
1916    0.00    0.00    7.87    9.71    0.00    0.88   10.11    2.89    7.36    1.61    1.08    0.65
1917    0.25    0.00    0.20    8.10    3.45    1.10    2.29    1.10    1.39    0.00    0.23    0.08
1918    0.00    0.14    3.68    3.43    0.00    0.00    0.00    0.00    0.00    0.45    0.79    0.11
1919    0.00    0.00    0.14    6.40    2.72    0.00    0.00    0.57    1.10    0.00    0.03    0.20
1920    0.23    0.48    0.34   13.42   15.46    2.41    3.14    0.93    1.10    0.54    0.34    0.06
1921    0.00    0.06    0.59    7.22    0.00    0.00    0.00    0.00    0.23    0.00    0.03    0.00
9999
```

file: HNODE_05.DAT

```
  10
1912    0.00    0.00    0.00    6.31    0.00    0.00   10.22    3.11    3.45    0.68    1.05    0.34
1913    0.00    0.00    0.06    7.56    0.00    0.14    3.31    1.25    1.47    1.05    0.79    0.11
1914    0.00    0.00    0.40    1.59    0.54    0.00    0.88    0.88    1.13    1.50    1.02    0.11
1915    0.00    0.00    0.40    5.41    1.73    0.00   25.91    5.32    3.40    1.59    0.88    0.28
1916    0.00    0.00    8.21   10.14    0.00    0.93   10.56    3.03    7.70    1.70    1.13    0.68
1917    0.25    0.00    0.20    8.47    3.60    1.16    2.41    1.16    1.44    0.00    0.23    0.08
1918    0.00    0.14    3.85    3.57    0.00    0.00    0.00    0.00    0.00    0.45    0.85    0.11
1919    0.00    0.00    0.14    6.68    2.83    0.00    0.00    0.59    1.16    0.00    0.03    0.23
1920    0.25    0.51    0.37   14.02   16.17    2.52    3.28    0.96    1.16    0.57    0.37    0.08
1921    0.00    0.06    0.62    7.53    0.00    0.00    0.00    0.00    0.25    0.00    0.03    0.00
9999
```

file: HNODE_06.DAT

```
  10
1912    5.13    6.06   14.13  109.93  110.86  110.69  375.85  168.60  158.77   81.27   45.87   19.79
1913    9.51    9.20   12.01  176.67  104.23  141.36  177.72  104.01   63.49   43.95   30.33   10.28
1914    6.74    6.60   14.16   39.56   58.81  103.92   74.22   44.66   41.06   54.03   31.06   10.25
1915    7.14    5.95   20.76   83.11  141.47  346.99  702.71  276.80  142.07   97.07   41.51   17.27
1916   11.13    8.86   95.94  149.51   97.98  336.26  330.51  239.14  272.38  111.57   61.90   29.87
1917   19.54   12.40   16.03  192.92  288.46  262.55  125.56   68.87   65.10   38.88   31.91   12.32
1918   12.43   12.26   73.82  112.05   51.90   82.69   48.11   38.28   33.16   31.69   22.14    8.78
1919    6.20    6.06    8.30  103.02   83.59   45.45   30.47   61.53   42.98   17.16   10.73    7.90
1920    8.44   10.76   11.38  211.24  402.10  120.12  154.33   55.33   33.36   20.98   11.61    6.26
1921    4.02    5.41   10.51  135.04   73.11   57.74   43.49   34.32   21.95    9.49    9.06    4.11
9999
```

file: HBNDRY07.DAT

```
  10
1912   90.78  107.09  112.96  316.61  414.28  522.81  834.27  522.47  381.14  270.26  190.12  122.07
1913   87.36  103.64  105.79  376.95  361.86  851.97  582.56  454.26  299.22  239.39  169.36  125.64
1914  110.75   99.08  146.28  170.41  407.90  547.62  436.87  264.65  191.11  292.68  193.86  115.53
1915  114.12  102.62  174.15  271.76  609.72 1049.39 1410.01  748.98  373.81  307.75  174.04  125.13
1916   97.64  135.50  443.16  404.05  350.65 1469.08 1376.74  602.58  569.51  355.35  211.22  149.88
1917  117.83  115.14  119.67  387.35  700.42 1334.15  682.58  322.47  238.26  230.61  147.73   95.00
1918  109.19  114.82  213.06  278.61  303.47  566.11  330.15  291.04  187.66  177.91  117.51  104.15
1919   94.04   99.34   95.88  219.74  353.42  415.10  225.69  340.45  187.49  122.44   93.33   97.72
1920   91.32   98.26  141.87  412.69  810.26  619.09  807.20  335.36  154.07  169.87  114.74  104.15
1921   89.93   94.80  119.16  275.66  434.92  651.32  357.44  237.83  121.17  113.64  105.79   99.02
9999
```

file: HDUMMY08.DAT

```
  10
1912   90.78  107.09  112.96  316.61  414.28  522.81  834.27  522.47  381.14  270.26  190.12  122.07
1913   87.36  103.64  105.79  376.95  361.86  851.97  582.56  454.26  299.22  239.39  169.36  125.64
1914  110.75   99.08  146.28  170.41  407.90  547.62  436.87  264.65  191.11  292.68  193.86  115.53
1915  114.12  102.62  174.15  271.76  609.72 1049.39 1410.01  748.98  373.81  307.75  174.04  125.13
1916   97.64  135.50  443.16  404.05  350.65 1469.08 1376.74  602.58  569.51  355.35  211.22  149.88
1917  117.83  115.14  119.67  387.35  700.42 1334.15  682.58  322.47  238.26  230.61  147.73   95.00
1918  109.19  114.82  213.06  278.61  303.47  566.11  330.15  291.04  187.66  177.91  117.51  104.15
1919   94.04   99.34   95.88  219.74  353.42  415.10  225.69  340.45  187.49  122.44   93.33   97.72
1920   91.32   98.26  141.87  412.69  810.26  619.09  807.20  335.36  154.07  169.87  114.74  104.15
1921   89.93   94.80  119.16  275.66  434.92  651.32  357.44  237.83  121.17  113.64  105.79   99.02
9999
```

APPENDIX C5

DESCRIPTION OF DATA FILES

FILE 5
BASIN CONFIGURATION

C5 - BASIN CONFIGURATION FILE

File Name: BASIN.DAT

```
Number of nodes in the basin (integer)

Node offset value (integer)

Node identifier (7-character string) ----------------->
Number of upstream nodes (integer)                    > repeat
First upstream node number (integer)                  > for
Second upstream node number (integer)                 > each
Third upstream node number (integer)                  > node
Single downstream node number (integer) -------------->

Number of irrigation areas in the basin (integer)

Area file identifier (7-character string) ------------>
Precipitation file identifier (7-character string)    >
Evapotranspiration file identifier (7-character       >
  string)                                             >
Number of supply nodes (integer)                      > repeat
Number of return nodes (integer)                      > for
                                                      > each
Supply node number* (integer) ------------> repeat    > irrigation
Percentage supplied by this node          > for each  > area
(real) % --------------------------------> supply     >
                                                      >
Return node number* (integer) ------------> repeat    >
Percentage returned to this node          > for each  >
  (real), % -----------------------------> return --->

Node identifier (7-character string) ---------------- >
Number of self-supply areas (integer)                 >
Number of upstream return areas (integer)             >
Number of downstream supply areas (integer)           >
                                                      >
Self-supply area number (integer) ---------> repeat   >
Percentage supplied by this node           > for each >
  (real), %                                > self-    >
Percentage returned to this node           > supply   >
  (real), % ------------------------------>           > repeat
                                                      > for
Upstream return area number (integer) ------> repeat  > each
Percentage returned to this node           > for each > node
  (real), % ------------------------------> upstream >
                                            return   >
                                            area     >
                                                      >
```

---

*Not including offset value.

```
Downstream supply area number (integer) ----> repeat   >
Percentage supplied by this node            > for each >
  (real), % --------------------------------> down-    >
                                              stream   >
                                              supply   >
                                              area ---->
```

file: BASIN.DAT

```
8
0
 'RSRVR01'  0  0  0  0  2
 'NODE_02'  1  1  0  0  3
 'NODE_03'  1  2  0  0  6
 'NODE_04'  0  0  0  0  6
 'NODE_05'  0  0  0  0  6
 'NODE_06'  3  3  4  5  7
 'BNDRY07'  1  6  0  0  8
 'DUMMY08'  1  7  0  0  0
7
 'AREA1   ' 'GAGE_P1' 'GAGE_E1'  1       1
                                 2,100.0
                                        2,100.0
 'AREA2   ' 'GAGE_P1' 'GAGE_E1'  1       1
                                 3,100.0
                                        3,100.0
 'AREA3   ' 'GAGE_P1' 'GAGE_E1'  1       1
                                 5,100.0
                                        5,100.0
 'AREA4   ' 'GAGE_P1' 'GAGE_E1'  1       1
                                 4,100.0
                                        4,100.0
 'AREA5   ' 'GAGE_P1' 'GAGE_E1'  1       1
                                 6,100.0
                                        6,100.0
 'AREA6   ' 'GAGE_P1' 'GAGE_E1'  1       2
                                 0,100.0
                                        0, 55.0
                                        4, 45.0
 'AREA7   ' 'GAGE_P2' 'GAGE_E1'  1       2
                                 0,100.0
                                        0, 30.0
                                        6, 70.0
 'RSRVR01'  0              0        0
 'NODE_02'  1              0        0
            1,100.0,100.0
 'NODE_03'  1              0        0
            2,100.0,100.0
 'NODE_04'  1              1        0
            4,100.0,100.0
                           6, 45.0
 'NODE_05'  1              0        0
            3,100.0,100.0
 'NODE_06'  1              1        0
            5,100.0,100.0
                           7, 70.0
 'BNDRY07'  0              0        0
 'DUMMY08'  0              0        0
```

APPENDIX C6

DESCRIPTION OF DATA FILES

FILE 6
BASIN HYDROLOGY

C6 - BASIN HYDROLOGY FILE

File Name: BASIN.HYD

Number of years of data (integer)

Year (integer) -------------------------> repeat -----> repeat
Node identifier (7-character string) ----> for each > for each
Local supply[*] (integer), m^3/s -----------> node -------> year

9999

---

[*] Calculated monthly as the streamflow at the node minus the sum of the streamflows at the nodes immediately upstream. At the user's option, negative values at all nodes can either be set to zero or left negative. Also, at the user's option a regulated flow record can override the calculated results at selected nodes.

file: BASIN.HYD

```
  10
1912 'RSRVR01'     116,    131,    242,    924,   1904,   1904,   4860,   2400,   2183,   1281,    621,    286
1912 'NODE_02'     125,    143,    262,    995,   2050,   2049,   5231,   2584,   2349,   1379,    669,    309
1912 'NODE_03'       0,      0,      0,    788,      0,      0,   1277,    389,    431,     84,    132,     42
1912 'NODE_04'       0,      0,      0,    213,      0,      0,    345,    105,    117,     23,     36,     11
1912 'NODE_05'       0,      0,      0,    223,      0,      0,    361,    110,    122,     24,     37,     12
1912 'NODE_06'       0,      0,      0,    739,      0,      0,   1199,    366,    405,     79,    125,     39
1912 'BNDRY07'    3025,   3568,   3490,   7299,  10715,  14554,  16189,  12497,   7853,   6674,   5094,   3612
1912 'DUMMY08'       0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0
1913 'RSRVR01'     200,    190,    197,   1872,   1975,   2382,   2525,   1581,    860,    589,    397,    157
1913 'NODE_02'     217,    206,    213,   2015,   2126,   2564,   2717,   1703,    927,    634,    428,    170
1913 'NODE_03'       0,      0,      6,    944,      0,     18,    415,    156,    183,    132,     99,     14
1913 'NODE_04'       0,      0,      2,    255,      0,      5,    112,     42,     50,     36,     27,      4
1913 'NODE_05'       0,      0,      2,    267,      0,      5,    117,     44,     52,     37,     28,      4
1913 'NODE_06'       0,      0,      4,    886,      0,     16,    390,    147,    170,    124,     92,     14
1913 'BNDRY07'    2749,   3335,   3312,   7073,   9098,  25095,  14297,  12369,   8325,   6902,   4910,   4074
1913 'DUMMY08'       0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0
1914 'RSRVR01'     133,    143,    183,    434,    919,   1767,   1132,    630,    528,    693,    377,    157
1914 'NODE_02'     145,    155,    197,    468,    989,   1902,   1219,    679,    570,    746,    406,    171
1914 'NODE_03'       0,      0,     48,    199,     68,      0,    108,    108,    141,    188,    126,     14
1914 'NODE_04'       0,      0,     13,     54,     18,      0,     29,     29,     38,     51,     34,      4
1914 'NODE_05'       0,      0,     14,     56,     19,      0,     31,     31,     40,     53,     36,      4
1914 'NODE_06'       0,      0,     45,    186,     64,      1,    102,    100,    133,    177,    118,     12
1914 'BNDRY07'    3673,   3266,   4666,   4621,  12328,  15669,  12807,   7769,   5299,   8428,   5749,   3718
1914 'DUMMY08'       0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0
1915 'RSRVR01'     133,    130,    291,    602,   2146,   5928,   8067,   3910,   1904,   1413,    575,    250
1915 'NODE_02'     145,    141,    315,    649,   2311,   6380,   8681,   4208,   2050,   1521,    620,    270
1915 'NODE_03'       0,      0,     51,    676,    216,      0,   3237,    665,    426,    198,    109,     36
1915 'NODE_04'       0,      0,     14,    183,     58,      0,    876,    180,    115,     54,     29,     10
1915 'NODE_05'       0,      0,     14,    191,     61,      0,    915,    188,    120,     56,     31,     10
1915 'NODE_06'       0,      0,     48,    634,    204,      0,   3040,    624,    402,    186,    102,     34
1915 'BNDRY07'    3778,   3414,   5417,   6662,  16536,  24805,  24978,  16675,   8184,   7440,   4680,   3809
1915 'DUMMY08'       0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0
1916 'RSRVR01'     200,    180,    399,   1020,   1726,   5581,   4036,   3613,   3476,   1643,    882,    406
1916 'NODE_02'     216,    195,    430,   1099,   1858,   6006,   4344,   3889,   3742,   1768,    950,    437
1916 'NODE_03'       0,      0,   1027,   1268,      0,    116,   1321,    378,    963,    212,    142,     85
1916 'NODE_04'       0,      0,    278,    343,      0,     31,    357,    102,    260,     57,     38,     23
1916 'NODE_05'       0,      0,    290,    358,      0,     33,    373,    107,    272,     60,     40,     24
1916 'NODE_06'       0,      0,    964,   1192,      0,    108,   1241,    356,    906,    200,    134,     80
1916 'BNDRY07'    3055,   4472,  12262,   8989,   8923,  40005,  36947,  12835,  10493,   8609,   5273,   4238
1916 'DUMMY08'       0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0
1917 'RSRVR01'     294,    229,    241,   2012,   4365,   4291,   1776,    999,    888,    704,    508,    195
1917 'NODE_02'     317,    248,    260,   2166,   4698,   4618,   1911,   1075,    957,    758,    548,    210
1917 'NODE_03'      32,      0,     26,   1057,    451,    146,    300,    144,    182,      0,     28,     12
1917 'NODE_04'       9,      0,      7,    286,    122,     39,     81,     39,     49,      0,      8,      3
1917 'NODE_05'       9,      0,      7,    299,    127,     41,     85,     41,     51,      0,      8,      3
1917 'NODE_06'      29,      0,     25,    993,    424,    137,    281,    134,    172,      0,     27,     12
1917 'BNDRY07'    3471,   3628,   3660,   6866,  14548,  37843,  19671,   8956,   6115,   6771,   4090,   2920
1917 'DUMMY08'       0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0,      0
```

```
1918 'RSRVR01'   219,   185,   679,  1370,   914,  1727,   893,   852,   642,   469,   250,   132
1918 'NODE_02'   236,   201,   731,  1475,   984,  1860,   962,   918,   692,   505,   270,   143
1918 'NODE_03'     0,    19,   480,   446,     0,     0,     0,     0,     0,    58,   105,    14
1918 'NODE_04'     0,     5,   130,   121,     0,     0,     0,     0,     0,    16,    28,     4
1918 'NODE_05'     0,     5,   136,   126,     0,     0,     0,     0,     0,    16,    30,     4
1918 'NODE_06'     0,    18,   451,   419,     0,     0,     0,     0,     0,    55,    99,    13
1918 'BNDRY07'  3417,  3622,  4917,  5882,  8884, 17072,  9960,  8926,  5456,  5164,  3368,  3368
1918 'DUMMY08'     0,     0,     0,     0,     0,     0,     0,     0,     0,     0,     0,     0
1919 'RSRVR01'   165,   130,   118,   751,   995,   880,   663,   959,   556,   318,   176,   101
1919 'NODE_02'   178,   141,   129,   809,  1071,   947,   714,  1032,   599,   344,   190,   110
1919 'NODE_03'     0,     0,    18,   834,   355,     0,     0,    73,   146,     0,     5,    27
1919 'NODE_04'     0,     0,     5,   226,    96,     0,     0,    20,    39,     0,     1,     7
1919 'NODE_05'     0,     0,     5,   236,   100,     0,     0,    21,    41,     0,     1,     8
1919 'NODE_06'     0,     0,    18,   782,   335,     0,     0,    68,   137,     0,     6,    26
1919 'BNDRY07'  3102,  3294,  3093,  4122,  9529, 13054,  6894,  9850,  5103,  3718,  2917,  3172
1919 'DUMMY08'     0,     0,     0,     0,     0,     0,     0,     0,     0,     0,     0,     0
1920 'RSRVR01'   106,   107,   139,  1490,  4415,  1665,  2130,   795,   394,   270,   143,    95
1920 'NODE_02'   115,   117,   151,  1604,  4752,  1793,  2292,   857,   424,   292,   154,   103
1920 'NODE_03'    31,    63,    45,  1752,  2019,   315,   412,   121,   144,    72,    45,     9
1920 'NODE_04'     8,    17,    12,   474,   546,    85,   111,    33,    39,    19,    12,     2
1920 'NODE_05'     9,    18,    13,   495,   571,    89,   116,    34,    41,    20,    13,     3
1920 'NODE_06'    29,    58,    42,  1645,  1897,   295,   389,   114,   136,    68,    43,     9
1920 'BNDRY07'  2927,  3090,  4608,  7114, 14414, 17621, 23056,  9889,  4263,  5258,  3642,  3457
1920 'DUMMY08'     0,     0,     0,     0,     0,     0,     0,     0,     0,     0,     0,     0
1921 'RSRVR01'    98,    84,    86,  1165,  1270,  1271,   875,   631,   335,   267,   147,    81
1921 'NODE_02'   106,    91,    93,  1255,  1367,  1368,   943,   680,   362,   289,   160,    89
1921 'NODE_03'     0,     6,    77,   942,     0,     0,     0,     0,    31,     0,     5,     0
1921 'NODE_04'     0,     2,    21,   255,     0,     0,     0,     0,     8,     0,     1,     0
1921 'NODE_05'     0,     2,    22,   266,     0,     0,     0,     0,     9,     0,     1,     0
1921 'NODE_06'     0,     6,    72,   886,     0,     0,     0,     0,    30,     0,     6,     0
1921 'BNDRY07'  3034,  3157,  3837,  4966, 12777, 20962, 11087,  7187,  3504,  3678,  3416,  3352
1921 'DUMMY08'     0,     0,     0,     0,     0,     0,     0,     0,     0,     0,     0,     0
9999
```

APPENDIX C7

DESCRIPTION OF DATA FILES

FILE 7
GAUGE RUN DATA

C7 - GAUGE DETAIL RUN FILE

File Name: Gxxxxxx.RUN

descriptor (string)
Gauge Name (25-character string)

descriptor (string)
Province Number (integer)

descriptor (string)
Forecast Year (integer)

Note: The remainder of the file is same format as the Gauge Detail Data File described in Appendix C3, with the exception that the Number of Development Scenarios must be either zero or one (where the development year is the same as the forecast year).

file: GRSRVR01.RUN

```
'Gauge Name    ' 'Reservoir No. 1           '
'Province Index'    2
'Forecast  Year' 1999
'Cutback increments'
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
'Groundwater Limit'    -99.000
'Urban Populatn'        0
          483.0  20.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                         0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
'Rural Populatn'        0
          137.0  70.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                         0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
'Livestock'
       0    20.4  90.0
       0    54.0  70.0
       0    68.0  70.0
       0     6.0  70.0
       0     3.5  95.0
       0     0.3  95.0
                         0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
'Industry'
       1   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       2   0.000 75.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       3   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       4   0.000 12.40   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       5   0.000 10.87   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       6   0.000 11.69   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       7   0.000 24.20   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       8   0.000  7.86   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       9   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      10   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      11   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      12   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      13   0.000  5.52   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      14   0.000  2.90   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      15   0.000 48.23   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      16   0.000  4.37   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      17   0.000  3.11   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      18   0.000  3.40   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      19   0.000  6.32   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      20   0.000  3.30   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      21   0.000 42.06   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      22   0.000 42.69   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      23   0.000 30.89   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      24   0.000  8.60   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      25   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      26   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      27   0.000  3.41   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      28   0.000 15.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      29   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      30   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
'Reservoir           ' 'Reservoir No. 1           '
'Full Supply Level   '  951.0
'Evaluation  Level   '  949.5  949.5  949.5  949.5  949.5  949.5  949.5  949.5  949.5  949.5  949.5  949.5
'Upper Rule Curve    '  948.0  948.0  948.0  948.0  948.0  948.0  948.0  948.0  948.0  948.0  948.0  948.0
'Evaluation  Level   '  944.0  941.5  939.0  939.0  941.5  944.0  946.5  946.5  946.5  946.5  946.5  946.5
'Lower Rule Curve    '  940.0  935.0  930.0  930.0  935.0  940.0  945.0  945.0  945.0  945.0  945.0  945.0
'Evaluation  Level   '  933.0  930.5  928.0  928.0  930.5  933.0  935.5  935.5  935.5  935.5  935.5  935.5
'Minimum Supply Level'  926.0
'Maximum     Outflow '  500.0  500.0  500.0  500.0  500.0  500.0  500.0  500.0  500.0  500.0  500.0  500.0
'Evaluation  Outflow '  258.0  258.0  258.0  258.0  258.0  258.0  258.0  258.0  258.0  258.0  258.0  258.0
'Target      Outflow '   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0
'Evaluation  Outflow '   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0
'Minimum     Outflow '   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0
'No. of Stage Points '    7
'Stage Elevation     '    924.0    929.0    934.0    939.0    944.0    948.0    951.0
'Storage Volume      '     10.0     25.0     52.0     90.0    145.0    210.0    260.0
```

```
'Surface Area        '      2.7      4.3      6.5      9.6     13.2     17.7     19.2
'No. of Scenarios    '    1
'Scenario Year       ' 1999
'Scenario Description' '1987 - Test Case Scneario                               '
'No. of Diversions   '    0
'No. of Minimum Flows'    0
'No. Energy Projects '    0
```

file: GNODE_02.RUN

```
 'Gauge Name     ' 'Node 2                    '
 'Province Index'     2
 'Forecast  Year' 1999
 'Cutback increments'
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 'Groundwater Limit'    -99.000
 'Urban Populatn'    78034
          426.0  20.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                         0.19   0.19   0.19   0.19   0.19   0.19   0.19   0.19   0.19   0.19   0.19   0.19
 'Rural Populatn'    36383
          137.0  70.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                         0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90
 'Livestock'
      410    20.4  90.0
       10    54.0  70.0
        9    68.0  70.0
       76     6.0  70.0
       13     3.5  95.0
      140     0.3  95.0
                         0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90
 'Industry'
        1   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        2   0.002 75.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        3   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        4   1.399 56.10  1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00
        5   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        6   0.443  5.30  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        7   0.000 24.20  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        8   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        9   0.001  0.00  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       10   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       11   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       12   0.006  0.00  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       13   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       14   0.003  2.90  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       15   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       16   0.000  4.40  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       17   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       18   0.051  3.40  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       19   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       20   0.099  3.30  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       21   0.081 45.40  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       22   0.014 57.20  1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00
       23   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       24   0.019  8.60  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       25   0.000  0.00  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       26   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       27   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       28   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       29   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       30   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
'Reservoir             ' 'NONE'
'No. of Scenarios     '    1
'Scenario Year        ' 1999
'Scenario Description' '1987 - Test Case Scenario                    '
'No. of Diversions    '    0
'No. of Minimum Flows'     0
'No. Energy Projects '     0
```

```
file:  GNODE_03.RUN


 'Gauge Name    ' 'Node 3
 'Province Index'    2
 'Forecast  Year' 1999
 'Cutback increments'
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 'Groundwater Limit'    -99.000
 'Urban Populatn'    14771
          352.0  20.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                         0.34   0.34   0.34   0.34   0.34   0.34   0.34   0.34   0.34   0.34   0.34   0.34
 'Rural Populatn'    28386
          137.0  70.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                         0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90
 'Livestock'
      283    20.4  90.0
        7    54.0  70.0
        4    68.0  70.0
       92     6.0  70.0
        3     3.5  95.0
      838     0.3  95.0
                         0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90
 'Industry'
        1   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        2   0.000 75.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        3   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        4   0.317 31.30  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        5   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        6   0.001  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        7   0.000 24.20  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        8   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        9   0.000  0.00  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       10   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       11   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       12   0.003  0.00  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       13   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       14   0.001  2.90  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       15   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       16   0.000  4.40  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       17   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       18   0.009  3.40  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       19   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       20   0.000  3.30  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       21   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       22   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       23   2.764 85.30  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       24   0.006  8.60  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       25   0.000  0.00  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       26   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       27   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       28   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       29   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       30   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
 'Reservoir          ' 'NONE'
 'No. of Scenarios   '    1
 'Scenario Year      ' 1989
 'Scenario Description' '1987 - Test Case Scenario                   '
 'No. of Diversions  '    1
 'Diversion No. 1          '              -37.000        0.00   0.00   0.00  14.29  14.29  14.29  14.29  14.29
14.29  14.29   0.00   0.00
 'No. of Minimum Flows'    0
 'No. Energy Projects '    0
```

file: GNODE_04.RUN

```
 'Gauge Name    ' 'Node 4                 '
 'Province Index'    2
 'Forecast  Year' 1999
 'Cutback increments'
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 'Groundwater Limit'    -99.000
 'Urban Populatn'    10588
           293.0  20.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                          0.44   0.44   0.44   0.44   0.44   0.44   0.44   0.44   0.44   0.44   0.44   0.44
 'Rural Populatn'    11455
           137.0  70.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                          0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90
 'Livestock'
       91   20.4  90.0
        2   54.0  70.0
        1   68.0  70.0
       30    6.0  70.0
        1    3.5  95.0
      206    0.3  95.0
                          0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90
 'Industry'
          1   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
          2   0.000 75.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
          3   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
          4   0.145 37.90   0.33   0.33   0.33   0.33   0.33   0.33   0.33   0.33   0.33   0.33   0.33   0.33
          5   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
          6   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
          7   0.000 24.20   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
          8   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
          9   0.001  0.00   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
         10   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         11   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         12   0.000  0.00   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
         13   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         14   0.000  2.90   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
         15   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         16   0.000  4.40   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
         17   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         18   0.009  3.40   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
         19   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         20   0.000  3.30   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
         21   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         22   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         23   2.764 85.30   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         24   0.000  8.60   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
         25   0.000  0.00   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
         26   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         27   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         28   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         29   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         30   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
 'Reservoir           ' 'NONE'
 'No. of Scenarios    '    1
 'Scenario Year       ' 1999
 'Scenario Description' '1987 - Committed Scenario                   '
 'No. of Diversions   '    0
 'No. of Minimum Flows'    0
 'No. Energy Projects '    0
```

file: GNODE_05.RUN

```
 'Gauge Name    ' 'Node 5
 'Province Index'    2
 'Forecast  Year' 1999
 'Cutback increments'
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 'Groundwater Limit'    -99.000
 'Urban Populatn'       0
           483.0  20.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                          0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
 'Rural Populatn'     1052
           137.0  70.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                          0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90
 'Livestock'
        43    20.4  90.0
         1    54.0  70.0
         0    68.0  70.0
         0     6.0  70.0
         0     3.5  95.0
         4     0.3  95.0
                          0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90
 'Industry'
         1   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         2   0.000 75.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         3   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         4   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         5   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         6   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         7   0.000 24.20  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
         8   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
         9   0.000  0.00  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        10   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        11   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        12   0.000  0.00  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        13   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        14   0.000  2.90  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        15   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        16   0.000  4.40  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        17   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        18   0.000  3.40  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        19   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        20   0.000  3.30  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        21   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        22   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        23   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        24   0.000  8.60  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        25   0.000  0.00  0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        26   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        27   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        28   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        29   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        30   0.000  0.00  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
  'Reservoir            ' 'NONE'
  'No. of Scenarios     '    1
  'Scenario Year        ' 1999
  'Scenario Description' '1987 - Test Case Scenario                                    '
  'No. of Diversions    '    2
  'Diversion No. 2             '             38.000         0.00   0.00   0.00   0.00  15.00  20.00  25.00  25.00
15.00   0.00   0.00   0.00
  'Diversion No. 3             '             15.000         0.00   0.00   0.00   0.00  25.00  25.00  25.00  25.00
0.00   0.00   0.00   0.00
  'No. of Minimum Flows'    0
  'No. Energy Projects '    1
  'Thermal Coal                ' 0     3.3  0.320E+00  25.0   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
8.33   8.33   8.33   8.33
                                                            0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
0.00   0.00   0.00   0.00
                                                            0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
0.00   0.00   0.00   0.00
```

```
file:  GNODE_06.RUN


 'Gauge Name    ' 'Node 6                     '
 'Province Index'    2
 'Forecast  Year' 1999
 'Cutback increments'
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 'Groundwater Limit'    -99.000
 'Urban Populatn'    3208
           674.0  20.0   0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                         0.54   0.54   0.54   0.54   0.54   0.54   0.54   0.54   0.54   0.54   0.54   0.54
 'Rural Populatn'   12331
           137.0  70.0   0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                         0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90
 'Livestock'
      219    20.4  90.0
        5    54.0  70.0
        3    68.0  70.0
       23     6.0  70.0
        2     3.5  95.0
      118     0.3  95.0
                         0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90   0.90
 'Industry'
        1  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        2  0.000 75.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        3  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        4  2.434 89.40   0.83   0.83   0.83   0.83   0.83   0.83   0.83   0.83   0.83   0.83   0.83   0.83
        5  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        6  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        7  0.000 24.20   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
        8  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        9  0.000  0.00   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       10  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       11  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       12  0.000  0.00   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       13  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       14  0.000  2.90   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       15  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       16  0.000  4.40   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       17  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       18  0.000  3.40   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       19  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       20  0.000  3.30   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       21  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       22  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       23  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       24  0.000  8.60   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       25  0.000  0.00   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03   0.03
       26  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       27  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       28  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       29  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       30  0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
 'Reservoir          ' 'NONE'
 'No. of Scenarios   '    1
 'Scenario Year      ' 1999
 'Scenario Description' '1987 - Test Case Scenario                          '
 'No. of Diversions  '    2
 'Diversion No. 2          '                -38.000        0.00   0.00  12.50  12.50  12.50  12.50  12.50  12.50
12.50  12.50   0.00   0.00
 'Diversion No. 3          '                -15.000        0.00   0.00   0.00   0.00  25.00  25.00  25.00  25.00
0.00   0.00   0.00   0.00
 'No. of Minimum Flows'    0
 'No. Energy Projects '    0
```

file: GBNDRY07.RUN

```
'Gauge Name    ' 'Boundary Node 7          '
'Province Index'    2
'Forecast  Year' 1999
'Cutback increments'
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
'Groundwater Limit'    -99.000
'Urban Populatn'         0
         483.0  20.0    0.70    0.70    0.70    1.00    1.30    1.30    1.30    1.30    1.30    1.00    0.70    0.70
                        0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
'Rural Populatn'         0
         137.0  70.0    0.70    0.70    0.70    1.00    1.30    1.30    1.30    1.30    1.30    1.00    0.70    0.70
                        0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
'Livestock'
       0    20.4  90.0
       0    54.0  70.0
       0    68.0  70.0
       0     6.0  70.0
       0     3.5  95.0
       0     0.3  95.0
                        0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
'Industry'
       1   0.000  0.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       2   0.000 75.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       3   0.000  0.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       4   0.000 12.40  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       5   0.000 10.87  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       6   0.000 11.69  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       7   0.000 24.20  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       8   0.000  7.86  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       9   0.000  0.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      10   0.000  0.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      11   0.000  0.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      12   0.000  0.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      13   0.000  5.52  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      14   0.000  2.90  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      15   0.000 48.23  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      16   0.000  4.37  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      17   0.000  3.11  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      18   0.000  3.40  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      19   0.000  6.32  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      20   0.000  3.30  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      21   0.000 42.06  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      22   0.000 42.69  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      23   0.000 30.89  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      24   0.000  8.60  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      25   0.000  0.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      26   0.000  0.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      27   0.000  3.41  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      28   0.000 15.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      29   0.000  0.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
      30   0.000  0.00  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
'Reservoir           ' 'NONE'
'No. of Scenarios    '    1
'Scenario Year       ' 1999
'Scenario Description' '1987 - Test Case Scenario                  '
'No. of Diversions   '    0
'No. of Minimum Flows'    0
'No. Energy Projects '    0
```

```
file:  GDUMMY08.RUN


 'Gauge Name    ' 'Dummy Node 8             '
 'Province Index'    4
 'Forecast  Year' 1999
 'Cutback increments'
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
  0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100
 'Groundwater Limit'    -99.000
 'Urban Populatn'        0
           355.0  20.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                          0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
 'Rural Populatn'        0
           137.0  70.0    0.70   0.70   0.70   1.00   1.30   1.30   1.30   1.30   1.30   1.00   0.70   0.70
                          0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
 'Livestock'
        0    20.4  90.0
        0    54.0  70.0
        0    68.0  70.0
        0     6.0  70.0
        0     3.5  95.0
        0     0.3  95.0
                          0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
 'Industry'
        1   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        2   0.000 75.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        3   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        4   0.000 12.40   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        5   0.000 10.87   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        6   0.000 11.69   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        7   0.000 24.20   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        8   0.000  7.86   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        9   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       10   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       11   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       12   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       13   0.000  5.52   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       14   0.000  2.90   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       15   0.000 48.23   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       16   0.000  4.37   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       17   0.000  3.11   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       18   0.000  3.40   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       19   0.000  6.32   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       20   0.000  3.30   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       21   0.000 42.06   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       22   0.000 42.69   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       23   0.000 30.89   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       24   0.000  8.60   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       25   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       26   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       27   0.000  3.41   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       28   0.000 15.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       29   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
       30   0.000  0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
'Reservoir            ' 'NONE'
'No. of Scenarios     '    1
'Scenario Year        ' 1999
'Scenario Description' '1987 - Test Case Scenario              '
'No. of Diversions    '    0
'No. of Minimum Flows'     0
'No. Energy Projects '     0
```

APPENDIX C8

DESCRIPTION OF DATA FILES

FILE 8
INTRAREGIONAL (REGIONAL) MATRIX

C8 - INTRAREGIONAL (REGIONAL) MATRIX FILE

File Name: xxxxxxxxx.I-O

```
Sector Number (integer) ------------------------------> repeat
                                                      > for each
Factor, sector 1 (real) ---------------> repeat       > of the
Factor, sector 2 (real)                > for each     > 30 major
      .                                > industrial   > industrial
      .                                > sector       > sectors
      .                                >              >
Factor, sector 30 (real) --------------> ------------->
```

Notes:

- The 'rows' of the file represent the various sectors and the 'columns' represent the circulation effect of one sector's growth on the others (including itself).
- The factors along the diagonal (that is, the effect of a sector's growth on itself) should represent only the additional 'circulation' effect. The model will attribute the full forecasted growth to the sector before calculating the additional 'circulation' effects.

```
file:  BC.I-O


  1  0.044296  0.020558  0.000333  0.006457  0.001623  0.130222  0.000000  0.000401  0.000009  0.000391
     0.002459  0.000034  0.004097  0.001595  0.000997  0.000133  0.007274  0.000709  0.000166  0.000222
     0.002806  0.029046  0.003503  0.000291  0.026056  0.019344  0.012784  0.003527  0.025490  0.078568
  2  0.001195  0.135232  0.000390  0.006942  0.001629  0.004882  0.000000  0.000630  0.000008  0.001063
     0.002918  0.000037  0.002530  0.006012  0.001111  0.000195  0.007876  0.003706  0.001113  0.000526
     0.001257  0.035645  0.001659  0.001064  0.031402  0.108245  0.003424  0.000834  0.024671  0.358709
  3  0.000519  0.001028  0.001781  0.003695  0.021884  0.002069  0.000000  0.000310  0.000006  0.000084
     0.001084  0.000020  0.001253  0.002327  0.005477  0.002038  0.003561  0.006222  0.000179  0.000225
     0.004278  0.014947  0.006146  0.000360  0.016510  0.019319  0.024554  0.000691  0.014472  0.141112
  4  0.000749  0.001771  0.000484  0.005811  0.052643  0.003034  0.000000  0.000446  0.000006  0.000114
     0.002303  0.000028  0.001861  0.003591  0.001291  0.001010  0.003090  0.003923  0.000224  0.000329
     0.001297  0.014669  0.005059  0.000478  0.027748  0.027776  0.007725  0.001572  0.016059  0.219469
  5  0.000821  0.001873  0.000718  0.008913  0.003617  0.003261  0.000000  0.000962  0.000008  0.000119
     0.001355  0.000026  0.003416  0.003806  0.002133  0.002069  0.002094  0.005005  0.000282  0.000302
     0.005649  0.045148  0.006833  0.000881  0.012974  0.041797  0.014022  0.000888  0.023025  0.227153
  6  0.132332  0.123586  0.000365  0.004540  0.001050  0.069472  0.000000  0.001721  0.000010  0.000322
     0.003612  0.000042  0.019664  0.004351  0.001098  0.000301  0.022335  0.001098  0.000288  0.000241
     0.010135  0.012374  0.002008  0.000443  0.013469  0.029381  0.007341  0.002132  0.025934  0.138360
  7  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
     0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
     0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
  8  0.000649  0.002630  0.000678  0.004213  0.000634  0.002474  0.000000  0.004576  0.000008  0.000488
     0.002838  0.000031  0.011430  0.003002  0.001865  0.000115  0.004092  0.001025  0.000168  0.000220
     0.000631  0.004918  0.135171  0.002071  0.009004  0.023015  0.017761  0.000981  0.023247  0.158617
  9  0.000409  0.001094  0.000116  0.001052  0.000261  0.001558  0.000000  0.001184  0.000256  0.000788
     0.000752  0.000027  0.003772  0.002985  0.000320  0.000027  0.000864  0.000577  0.000135  0.000136
     0.000268  0.002511  0.000572  0.000381  0.004311  0.016564  0.002999  0.000407  0.015700  0.094337
 10  0.000559  0.001531  0.002014  0.001395  0.000427  0.002231  0.000000  0.010647  0.000146  0.014250
     0.001509  0.000070  0.005520  0.002328  0.006265  0.000109  0.002732  0.000771  0.000156  0.000186
     0.000385  0.002871  0.003489  0.000290  0.007050  0.018010  0.004438  0.000421  0.020805  0.123486
 11  0.001196  0.447485  0.000414  0.006392  0.001240  0.003797  0.000000  0.000559  0.000009  0.000501
     0.076594  0.003817  0.005253  0.004428  0.001227  0.000130  0.005182  0.002235  0.000563  0.000382
     0.000996  0.019023  0.003380  0.000750  0.022293  0.057640  0.012274  0.001926  0.023229  0.265939
 12  0.000553  0.030635  0.000362  0.002756  0.000472  0.001956  0.000000  0.003824  0.000018  0.002007
     0.068483  0.006228  0.016049  0.002187  0.001102  0.000647  0.017534  0.000881  0.000205  0.000908
     0.000579  0.006655  0.005044  0.000260  0.006809  0.017052  0.007738  0.000823  0.029131  0.090182
 13  0.001308  0.134877  0.001145  0.015253  0.001653  0.003882  0.000000  0.000770  0.000008  0.000264
     0.116080  0.000803  0.040855  0.002514  0.003543  0.000121  0.005807  0.001129  0.000257  0.000233
     0.001876  0.033581  0.037725  0.000490  0.015572  0.029944  0.028888  0.003428  0.018728  0.141728
 14  0.000667  0.021736  0.000527  0.003909  0.000684  0.002378  0.000000  0.001324  0.000009  0.000188
     0.018702  0.000143  0.162982  0.042704  0.001608  0.000055  0.001928  0.000834  0.000188  0.000209
     0.000668  0.009297  0.015171  0.000811  0.010558  0.037832  0.011058  0.000875  0.019348  0.135612
 15  0.000478  0.001389  0.335554  0.007660  0.009071  0.001850  0.000000  0.000292  0.000008  0.000082
     0.002066  0.000030  0.001553  0.001881  0.049969  0.001137  0.004402  0.005058  0.000207  0.000341
     0.003191  0.011071  0.003122  0.000293  0.025721  0.017758  0.010499  0.001722  0.017326  0.113127
 16  0.001071  0.001710  0.004472  0.008860  0.002786  0.003824  0.000000  0.000360  0.000044  0.000139
     0.001901  0.000090  0.001956  0.002236  0.013943  0.000146  0.004008  0.002878  0.000426  0.000424
     0.007347  0.006610  0.003289  0.000489  0.015105  0.018943  0.053216  0.003068  0.074729  0.129032
 17  0.000447  0.002093  0.006888  0.002956  0.000633  0.001702  0.000000  0.000401  0.000009  0.000158
     0.003277  0.000032  0.004198  0.001798  0.021501  0.012260  0.049067  0.003619  0.001449  0.000892
     0.000498  0.004219  0.003615  0.000340  0.006631  0.016074  0.008064  0.000841  0.018091  0.100034
 18  0.000428  0.001301  0.004181  0.002087  0.001393  0.001642  0.000000  0.000279  0.000010  0.000128
     0.001950  0.000030  0.002086  0.001419  0.012880  0.012917  0.020024  0.030390  0.002582  0.002048
     0.001565  0.003121  0.001385  0.000201  0.006509  0.016047  0.007252  0.000507  0.020053  0.083593
 19  0.000443  0.006645  0.004689  0.001594  0.000520  0.001685  0.000000  0.001071  0.000009  0.000373
     0.014659  0.000509  0.002496  0.001658  0.014647  0.002749  0.039017  0.005232  0.015127  0.001829
     0.000486  0.003339  0.003803  0.000328  0.007585  0.016125  0.004240  0.000521  0.018082  0.099139
 20  0.000436  0.002279  0.028468  0.002335  0.001117  0.001624  0.000000  0.000479  0.000011  0.000065
     0.003188  0.000036  0.007299  0.001585  0.089053  0.000537  0.018095  0.001441  0.001158  0.016604
     0.000624  0.003718  0.013715  0.000299  0.007956  0.020954  0.007232  0.000608  0.020257  0.086975
 21  0.000660  0.003071  0.000596  0.029188  0.028926  0.002502  0.000000  0.000445  0.000006  0.000127
     0.002966  0.000033  0.014012  0.003146  0.001810  0.000504  0.006384  0.001238  0.000193  0.000273
     0.136749  0.038581  0.002498  0.001993  0.022044  0.029420  0.022185  0.006887  0.020425  0.175667
 22  0.000245  0.000718  0.000238  0.165141  0.009079  0.000960  0.000000  0.000163  0.000002  0.000045
     0.000987  0.000012  0.000801  0.001178  0.000695  0.000207  0.002521  0.000855  0.000101  0.000144
     0.000619  0.011626  0.001404  0.000320  0.015822  0.028842  0.005726  0.002127  0.006220  0.068668
 23  0.000853  0.002137  0.001990  0.014501  0.001573  0.003687  0 000000  0.001852  0.000008  0.000129
     0.001679  0.000028  0.006676  0.003440  0.006167  0.000215  0.013774  0.001160  0.000228  0.000271
     0.002251  0.009231  0.085130  0.003532  0.014011  0.030939  0.050611  0.003352  0.026077  0.190141
 24  0.000576  0.005083  0.005339  0.002125  0.000629  0.002061  0.000000  0.007183  0.000007  0.000952
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       0.008530  0.000051  0.013512  0.003361  0.016663  0.000108  0.004641  0.001123  0.000292  0.001217
       0.000724  0.006471  0.006746  0.055512  0.009162  0.024870  0.005277  0.000469  0.023439  0.134372
   25  0.000956  0.021021  0.001465  0.004604  0.037951  0.002375  0.000000  0.003187  0.000018  0.000516
       0.046973  0.000458  0.005465  0.002029  0.004420  0.001585  0.040066  0.003503  0.000459  0.004033
       0.032794  0.018984  0.005857  0.001820  0.007712  0.025693  0.004280  0.000811  0.038875  0.118715
   26  0.000496  0.001979  0.000282  0.013696  0.002158  0.001825  0.000000  0.000481  0.000006  0.000279
       0.002114  0.000030  0.001890  0.004628  0.000799  0.000200  0.002567  0.001042  0.001712  0.000936
       0.001405  0.056181  0.000720  0.000779  0.037105  0.107526  0.006312  0.001151  0.018330  0.117303
   27  0.000245  0.001153  0.000411  0.006311  0.001970  0.000956  0.000000  0.000225  0.000002  0.000048
       0.002139  0.000023  0.000700  0.001552  0.001289  0.000084  0.002005  0.000485  0.000069  0.000235
       0.001442  0.006987  0.000409  0.000173  0.043539  0.010720  0.021668  0.000146  0.004932  0.070050
   28  0.000310  0.000863  0.000180  0.007224  0.001353  0.001151  0.000000  0.000194  0.000002  0.000048
       0.001341  0.000018  0.000752  0.001391  0.000540  0.000059  0.001402  0.000513  0.000085  0.000185
       0.000879  0.018097  0.000349  0.000170  0.025807  0.018284  0.007031  0.000407  0.009266  0.083561
   29  0.006437  0.003013  0.000366  0.005602  0.000789  0.002983  0.000000  0.000911  0.000006  0.000298
       0.002941  0.000028  0.008103  0.003193  0.001069  0.000101  0.003635  0.000927  0.000213  0.000254
       0.000536  0.018060  0.000855  0.000370  0.011897  0.043224  0.013919  0.001550  0.013173  0.135556
   30  0.003524  0.004632  0.000585  0.003774  0.001932  0.014815  0.000000  0.001604  0.000015  0.000453
       0.003275  0.000060  0.006792  0.018410  0.001650  0.000208  0.006092  0.005502  0.000745  0.001172
       0.001739  0.012881  0.002282  0.001643  0.043576  0.098019  0.006600  0.001134  0.050399  0.138180
```

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file:  ALBERTA.I-O


 1  0.084719  0.000176  0.000000  0.057695  0.004915  0.056165  0.000000  0.000463  0.000006  0.000103
    0.000694  0.000027  0.000786  0.001258  0.001675  0.000173  0.003776  0.000851  0.000183  0.000071
    0.001228  0.056769  0.023660  0.000191  0.024408  0.017720  0.014562  0.002431  0.022421  0.102651
 2  0.002529  0.013738  0.000000  0.035587  0.005548  0.004009  0.000000  0.000309  0.000004  0.000608
    0.001150  0.000038  0.000347  0.003058  0.000466  0.000372  0.003057  0.003457  0.000408  0.000171
    0.001274  0.034791  0.001963  0.000996  0.031524  0.113807  0.003726  0.000688  0.017408  0.263968
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 5  0.002330  0.000149  0.000000  0.049660  0.005466  0.003631  0.000000  0.000251  0.000003  0.000062
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 6  0.591850  0.000965  0.000000  0.037954  0.004191  0.170606  0.000000  0.001497  0.000065  0.000288
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14  0.001186  0.000205  0.000000  0.007190  0.001404  0.001775  0.000000  0.000170  0.000002  0.000036
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21  0.001761  0.001107  0.000000  0.030504  0.019612  0.002662  0.000000  0.001141  0.000003  0.000105
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22  0.003413  0.000188  0.000000  0.932634  0.028184  0.005528  0.000000  0.000463  0.000003  0.000105
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27	0.000799	0.000082	0.000000	0.122817	0.007360	0.001284	0.000000	0.000162	0.000001	0.000039
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28	0.000917	0.000117	0.000000	0.021423	0.007218	0.001423	0.000000	0.000220	0.000001	0.000051
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29	0.014624	0.000719	0.000000	0.028656	0.002897	0.003410	0.000000	0.001398	0.000111	0.000181
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25  0.001465  0.003871  0.004837  0.004640  0.036238  0.001638  0.000000  0.001396  0.000000  0.000059
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27  0.000407  0.000095  0.000207  0.027972  0.001525  0.000601  0.000000  0.000034  0.000000  0.000004
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28  0.000508  0.000236  0.000300  0.001700  0.002151  0.000703  0.000000  0.000085  0.000000  0.000007
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file:  MANITOBA.I-O

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19 0.000877 0.000496 0.004890 0.000020 0.000566 0.002681 0.000004 0.015557 0.000201 0.003531
   0.001464 0.000351 0.003868 0.003567 0.026736 0.047762 0.025900 0.007728 0.051072 0.007856
   0.005948 0.004711 0.008955 0.001748 0.006704 0.014862 0.006711 0.001184 0.014018 0.104336
20 0.001162 0.001110 0.010291 0.000026 0.000724 0.003450 0.000007 0.006388 0.000212 0.001371
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21 0.001503 0.001837 0.001793 0.000139 0.032553 0.004625 0.000005 0.008280 0.000158 0.002205
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   0.001414 0.041203 0.024071 0.000607 0.018720 0.028899 0.007689 0.001827 0.007617 0.045748
23 0.004381 0.001900 0.001864 0.000222 0.002287 0.018311 0.000008 0.008975 0.000142 0.001042
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   0.005880 0.082825 0.142305 0.004009 0.015042 0.032154 0.021731 0.013296 0.026496 0.169857
24 0.002252 0.001797 0.005567 0.000027 0.000593 0.005668 0.000010 0.014306 0.001005 0.005710
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25  0.001963  0.004863  0.002596  0.000041  0.006942  0.004112  0.000012  0.010338  0.000225  0.003571
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26  0.001033  0.000385  0.000463  0.000108  0.000538  0.002943  0.000004  0.004046  0.000061  0.000791
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27  0.000343  0.000214  0.000694  0.000050  0.000283  0.001015  0.000001  0.000626  0.000018  0.000196
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28  0.001035  0.000308  0.000185  0.000078  0.000291  0.003071  0.000002  0.001261  0.000042  0.000369
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file:  QUEBEC.I-O


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 6  0.261182  0.007235  0.000144  0.000000  0.000775  0.188015  0.000030  0.004019  0.000150  0.001694
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 7  0.003720  0.007631  0.000097  0.000000  0.000166  0.004886  0.005914  0.003757  0.000095  0.003457
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file: NB.I-O

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    0.000393  0.000038  0.003542  0.000884  0.000015  0.000000  0.000348  0.000023  0.000152  0.000020
    0.000354  0.003571  0.000078  0.000070  0.002938  0.013193  0.004966  0.000023  0.013575  0.058781
10  0.000302  0.000983  0.000031  0.000081  0.000073  0.001155  0.000000  0.000108  0.000000  0.005339
    0.000524  0.000037  0.002028  0.001318  0.000052  0.000000  0.000470  0.000030  0.000105  0.000029
    0.000368  0.008354  0.000070  0.000093  0.007174  0.012592  0.007414  0.000023  0.018470  0.078575
11  0.004990  0.294430  0.000055  0.000213  0.000178  0.002378  0.000000  0.000085  0.000001  0.000533
    0.044596  0.000047  0.001229  0.002288  0.000092  0.000000  0.001786  0.000075  0.003195  0.000616
    0.001833  0.018106  0.000549  0.000312  0.012837  0.026149  0.018841  0.000041  0.018433  0.151933
12  0.000536  0.014874  0.000024  0.000065  0.000073  0.001583  0.000000  0.000108  0.000000  0.000498
    0.046809  0.005075  0.006180  0.001127  0.000040  0.000000  0.001515  0.000027  0.000222  0.000054
    0.000805  0.003654  0.001122  0.000133  0.005070  0.011265  0.005399  0.000136  0.017027  0.063249
13  0.002936  0.164190  0.000686  0.000622  0.000751  0.001775  0.000000  0.000090  0.000000  0.000291
    0.049764  0.000045  0.016829  0.001555  0.001181  0.000000  0.002066  0.000050  0.001806  0.000068
    0.002176  0.057378  0.003021  0.000218  0.012302  0.017963  0.058603  0.000896  0.015198  0.103104
14  0.000378  0.003208  0.000025  0.000083  0.000096  0.001535  0.000000  0.000048  0.000001  0.000028
    0.001313  0.000045  0.017894  0.012057  0.000041  0.000000  0.000639  0.000042  0.000172  0.000040
    0.000397  0.006120  0.000134  0.000131  0.009231  0.032323  0.007559  0.000044  0.013870  0.113740
15  0.000495  0.000782  0.581222  0.000380  0.009462  0.002271  0.000000  0.000076  0.000001  0.000033
    0.000941  0.000059  0.001511  0.002732  0.002517  0.000000  0.014172  0.000379  0.004193  0.000145
    0.002993  0.021911  0.000707  0.000209  0.014584  0.022549  0.034308  0.000184  0.019107  0.183784
16  0.001278  0.003025  0.000054  0.003060  0.012024  0.006563  0.000000  0.000236  0.000001  0.000078
    0.002613  0.000367  0.010548  0.002652  0.000091  0.000000  0.043580  0.000896  0.017297  0.000469
    0.019904  0.092076  0.000286  0.000295  0.045519  0.021737  0.282744  0.000077  0.077909  0.172538
17  0.000226  0.000408  0.000545  0.000069  0.000076  0.001062  0.000000  0.000035  0.000000  0.000015
    0.000612  0.000042  0.000585  0.000860  0.000936  0.000000  0.016538  0.000083  0.000936  0.000106
    0.000626  0.006133  0.000689  0.000072  0.005475  0.011051  0.006049  0.000121  0.011558  0.057339
18  0.000359  0.000513  0.000108  0.000083  0.000058  0.001842  0.000000  0.000053  0.000000  0.000022
    0.000826  0.000093  0.000490  0.000933  0.000185  0.000000  0.016946  0.000742  0.000293  0.000082
    0.000237  0.005068  0.000840  0.000083  0.005018  0.013152  0.007771  0.000020  0.021041  0.061536
19  0.000237  0.002998  0.000025  0.000057  0.000069  0.000881  0.000000  0.000028  0.000000  0.000018
    0.009980  0.000184  0.000289  0.000973  0.000041  0.000000  0.012939  0.000258  0.005347  0.000609
    0.000490  0.003617  0.000686  0.000076  0.006617  0.015732  0.004920  0.000280  0.008564  0.065002
20  0.000332  0.001498  0.002939  0.000915  0.000269  0.001975  0.000000  0.000063  0.000001  0.000028
    0.002079  0.000058  0.004532  0.002148  0.005067  0.000000  0.002308  0.000054  0.000579  0.013612
    0.000514  0.004646  0.000606  0.000163  0.006570  0.022461  0.005961  0.000039  0.017037  0.143309
21  0.000404  0.002155  0.000034  0.010264  0.032634  0.001641  0.000000  0.000494  0.000001  0.000029
    0.001118  0.000042  0.010714  0.001982  0.000058  0.000000  0.006210  0.000063  0.000156  0.000046
    0.081882  0.042231  0.000582  0.000417  0.010990  0.018167  0.032010  0.000163  0.017080  0.131870
22  0.000081  0.000155  0.000004  0.000127  0.000126  0.000319  0.000000  0.000366  0.000000  0.000006
    0.000226  0.000004  0.000266  0.000509  0.000007  0.000000  0.000232  0.000013  0.000033  0.000014
    0.002489  0.001391  0.000028  0.000252  0.005063  0.005072  0.005812  0.000009  0.003044  0.034260
23  0.000364  0.001443  0.009673  0.001532  0.002062  0.001475  0.000000  0.000525  0.000001  0.000027
    0.000847  0.000030  0.006113  0.002289  0.016682  0.000000  0.002009  0.000054  0.000243  0.000046
    0.003477  0.034668  0.059256  0.000311  0.011025  0.021375  0.050382  0.000355  0.014871  0.132295
24  0.000397  0.003457  0.001259  0.000093  0.000102  0.001637  0.000000  0.000173  0.000000  0.000049
```

```
    0.006123  0.000054  0.010358  0.001612  0.002171  0.000000  0.000681  0.000042  0.000155  0.000153
    0.000648  0.007136  0.001115  0.034997  0.006101  0.021883  0.008280  0.000948  0.015695  0.107765
25  0.000806  0.010694  0.000051  0.000432  0.007275  0.001970  0.000000  0.000737  0.000002  0.000076
    0.035920  0.000347  0.001031  0.001086  0.000086  0.000000  0.026351  0.000091  0.000541  0.001237
    0.032462  0.017502  0.001386  0.000946  0.005102  0.014484  0.003682  0.000045  0.031037  0.071738
26  0.000451  0.001071  0.000020  0.000130  0.000382  0.001540  0.000000  0.000083  0.000001  0.000172
    0.001717  0.000047  0.000467  0.002517  0.000031  0.000000  0.003044  0.000047  0.002988  0.000101
    0.001841  0.038408  0.000452  0.000178  0.042274  0.107204  0.005014  0.000201  0.020867  0.114070
27  0.000202  0.000332  0.000007  0.010174  0.001920  0.000990  0.000000  0.000091  0.000000  0.000013
    0.000657  0.000043  0.000207  0.000903  0.000011  0.000000  0.000615  0.000024  0.000053  0.000034
    0.000903  0.154880  0.000062  0.000105  0.016094  0.007481  0.002157  0.000024  0.009635  0.052462
28  0.000581  0.000588  0.000021  0.000175  0.000157  0.001837  0.000000  0.000076  0.000001  0.000046
    0.000790  0.000033  0.000872  0.002601  0.000033  0.000000  0.000936  0.000084  0.000143  0.000060
    0.000699  0.053544  0.000119  0.000204  0.016337  0.022306  0.018063  0.000682  0.038127  0.174584
29  0.006953  0.001782  0.000034  0.000181  0.000124  0.002322  0.000000  0.000073  0.000001  0.000780
    0.001199  0.000027  0.004870  0.002277  0.000052  0.000000  0.002471  0.000097  0.000498  0.000052
    0.000511  0.016129  0.000255  0.000166  0.009917  0.046130  0.016250  0.000205  0.012873  0.128179
30  0.002187  0.002123  0.000114  0.000082  0.000366  0.009732  0.000000  0.000278  0.000004  0.000137
    0.002585  0.000070  0.001354  0.016474  0.000193  0.000000  0.003708  0.000378  0.000631  0.000297
    0.001687  0.009402  0.000604  0.001147  0.045727  0.086833  0.005407  0.000227  0.052873  0.116948
```

```
file:  PEI.I-O

 1  0.032128  0.005759  0.000000  0.000000  0.000093  0.042915  0.000000  0.000001  0.000001  0.000597
    0.000628  0.000000  0.000000  0.000449  0.000000  0.000000  0.000075  0.002208  0.000155  0.000010
    0.000432  0.000000  0.030405  0.000000  0.032281  0.008938  0.012548  0.000172  0.015452  0.049507
 2  0.000704  0.009041  0.000000  0.000000  0.000092  0.001611  0.000000  0.000001  0.000000  0.000077
    0.001975  0.000000  0.000000  0.000288  0.000000  0.000000  0.000138  0.002296  0.024210  0.000010
    0.000429  0.000000  0.000314  0.000000  0.031848  0.003758  0.001192  0.000049  0.009562  0.034454
 3  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
 4  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
 5  0.001169  0.000727  0.000000  0.000000  0.000024  0.001809  0.000000  0.000001  0.000000  0.000044
    0.000168  0.000000  0.000000  0.001316  0.000000  0.000000  0.000259  0.003256  0.000044  0.000006
    0.000123  0.000000  0.000272  0.000000  0.008735  0.014963  0.014810  0.000064  0.021812  0.160182
 6  0.295318  0.137261  0.000000  0.000000  0.000052  0.033951  0.000000  0.000010  0.000001  0.001046
    0.000539  0.000000  0.000000  0.001273  0.000000  0.000000  0.000051  0.001044  0.003306  0.000007
    0.000244  0.000000  0.008797  0.000000  0.018107  0.008692  0.011947  0.002268  0.011194  0.066854
 7  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
 8  0.000374  0.000075  0.000000  0.000000  0.000006  0.000454  0.000000  0.000000  0.000000  0.000015
    0.000040  0.000000  0.000000  0.000331  0.000000  0.000000  0.000005  0.000079  0.000009  0.000002
    0.000027  0.000000  0.000026  0.000000  0.002029  0.001436  0.000346  0.000017  0.012292  0.040370
 9  0.000922  0.000316  0.000000  0.000000  0.000015  0.002120  0.000000  0.000002  0.000000  0.000073
    0.000121  0.000000  0.000000  0.000755  0.000000  0.000000  0.045847  0.000167  0.000021  0.000003
    0.000068  0.000000  0.000077  0.000000  0.005054  0.007580  0.004298  0.000039  0.006013  0.091768
10  0.001009  0.000365  0.000000  0.000000  0.000011  0.002411  0.000000  0.000001  0.000001  0.002687
    0.000089  0.000000  0.000000  0.000632  0.000000  0.000000  0.000012  0.000575  0.000020  0.000003
    0.000052  0.000000  0.000086  0.000000  0.003869  0.008097  0.010804  0.031782  0.013026  0.060798
11  0.016255  0.001561  0.000000  0.000000  0.000010  0.006364  0.000000  0.000021  0.000002  0.000279
    0.025914  0.000000  0.000000  0.000436  0.000000  0.000000  0.000029  0.000139  0.000048  0.000002
    0.000048  0.000000  0.000575  0.000000  0.003494  0.007467  0.005034  0.000044  0.017047  0.050670
12  0.000801  0.000254  0.000000  0.000000  0.000007  0.001761  0.000000  0.000004  0.000000  0.000076
    0.008669  0.000000  0.000000  0.000307  0.000000  0.000000  0.004938  0.015454  0.000014  0.000002
    0.000031  0.000000  0.002821  0.000000  0.002279  0.001445  0.007959  0.000023  0.007448  0.036959
13  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
14  0.001119  0.000392  0.000000  0.000000  0.000020  0.002423  0.000000  0.000001  0.000000  0.000083
    0.000143  0.000000  0.000000  0.032501  0.000000  0.000000  0.000018  0.000218  0.000030  0.000004
    0.000091  0.000000  0.000106  0.000000  0.006745  0.025710  0.009947  0.000053  0.009921  0.117521
15  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
16  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
17  0.000895  0.000363  0.000000  0.000000  0.000013  0.002269  0.000000  0.000001  0.000000  0.000091
    0.000302  0.000000  0.000000  0.000536  0.000000  0.000000  0.000010  0.000127  0.000019  0.000003
    0.000061  0.000000  0.000090  0.000000  0.004529  0.008982  0.013952  0.000031  0.006061  0.064460
18  0.001436  0.000589  0.000000  0.000000  0.000013  0.004040  0.000000  0.000001  0.000001  0.000181
    0.000099  0.000000  0.000000  0.000487  0.000000  0.000000  0.000317  0.041712  0.000157  0.000023
    0.000060  0.000000  0.000125  0.000000  0.004409  0.008439  0.002668  0.000037  0.011267  0.057809
19  0.001026  0.000407  0.000000  0.000000  0.000012  0.002403  0.000000  0.000001  0.000000  0.000097
    0.005710  0.000000  0.000000  0.000561  0.000000  0.000000  0.000013  0.000463  0.000112  0.000017
    0.000058  0.000000  0.002695  0.000000  0.004255  0.011337  0.010540  0.001223  0.007543  0.067264
20  0.000386  0.000141  0.000000  0.000000  0.000007  0.000739  0.000000  0.000000  0.000000  0.000026
    0.000055  0.000000  0.000000  0.000345  0.000000  0.000000  0.001267  0.004010  0.000012  0.000091
    0.000032  0.000000  0.000891  0.000000  0.002378  0.010392  0.003436  0.000020  0.004830  0.041443
21  0.000587  0.000369  0.000000  0.000000  0.000013  0.001054  0.000000  0.000000  0.000000  0.000029
    0.000086  0.000000  0.000000  0.000631  0.000000  0.000000  0.000068  0.000143  0.000021  0.000003
    0.000060  0.000000  0.000133  0.000000  0.004390  0.008364  0.007222  0.000394  0.007937  0.076657
22  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
    0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
23  0.000671  0.000328  0.000000  0.000000  0.000038  0.001375  0.000000  0.000000  0.000000  0.000044
    0.000251  0.000000  0.000000  0.000643  0.000000  0.000000  0.000020  0.000224  0.000021  0.000005
    0.000179  0.000000  0.239913  0.000000  0.013304  0.009316  0.002048  0.001654  0.006009  0.078119
24  0.001955  0.000740  0.000000  0.000000  0.000020  0.005087  0.000000  0.000001  0.000001  0.000212
```

```
    0.000164  0.000000  0.000000  0.001000  0.000000  0.000000  0.000024  0.000227  0.000038  0.000005
    0.000093  0.000000  0.000161  0.000007  0.006840  0.017372  0.004843  0.000063  0.014613  0.120045
25  0.002427  0.000793  0.000000  0.000000  0.002904  0.004162  0.000000  0.000009  0.000001  0.000374
    0.018225  0.000000  0.000000  0.000500  0.000000  0.000000  0.000960  0.007688  0.000209  0.000276
    0.013414  0.000000  0.003678  0.000000  0.004186  0.007048  0.001675  0.000075  0.019399  0.059282
26  0.001443  0.000716  0.000000  0.000000  0.000064  0.002408  0.000000  0.000003  0.000000  0.000238
    0.000426  0.000000  0.000000  0.001643  0.000000  0.000000  0.000096  0.000374  0.000224  0.000009
    0.000299  0.000000  0.000319  0.000000  0.021961  0.052034  0.005006  0.000283  0.012429  0.125643
27  0.000545  0.000200  0.000000  0.000000  0.000145  0.001336  0.000000  0.000001  0.000000  0.000064
    0.000916  0.000000  0.000000  0.000384  0.000000  0.000000  0.000052  0.000425  0.000019  0.000014
    0.000671  0.000000  0.000212  0.000000  0.050205  0.003816  0.000265  0.000018  0.003730  0.000000
28  0.002003  0.000557  0.000000  0.000000  0.000055  0.003534  0.000000  0.000001  0.000000  0.000107
    0.000392  0.000000  0.000000  0.001950  0.000000  0.000000  0.000037  0.000484  0.000051  0.000010
    0.000252  0.000000  0.000183  0.000000  0.018850  0.016986  0.018933  0.001163  0.029454  0.237466
29  0.012882  0.000394  0.000000  0.000000  0.000031  0.002111  0.000000  0.000014  0.000000  0.000799
    0.000287  0.000000  0.000000  0.001083  0.000000  0.000000  0.000026  0.001006  0.000207  0.000033
    0.000144  0.000000  0.000479  0.000000  0.010715  0.028950  0.013563  0.000295  0.006354  0.102984
30  0.008735  0.002046  0.000000  0.000000  0.000160  0.012489  0.000000  0.000004  0.000000  0.000193
    0.001054  0.000000  0.000000  0.009265  0.000000  0.000000  0.000131  0.001968  0.000196  0.000037
    0.000742  0.000000  0.000605  0.000000  0.055418  0.032360  0.005705  0.000404  0.034232  0.137756
```

```
file:  MS.I-O


  1  0.040527  0.055856  0.000000  0.002048  0.010504  0.233766  0.000000  0.000486  0.000000  0.000382
     0.002413  0.000009  0.002843  0.001175  0.000037  0.000311  0.004431  0.000296  0.001273  0.000220
     0.001826  0.045702  0.006600  0.000181  0.045353  0.013447  0.026844  0.001038  0.019585  0.060017
  2  0.000523  0.081928  0.000000  0.000241  0.003070  0.001925  0.000000  0.000517  0.000000  0.000121
     0.004673  0.000004  0.000325  0.001036  0.000021  0.000250  0.001172  0.001061  0.022135  0.000849
     0.000659  0.057206  0.000095  0.001696  0.015676  0.034428  0.002398  0.000018  0.011799  0.075445
  3  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
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  5  0.000878  0.002091  0.000000  0.001665  0.010165  0.003471  0.000000  0.000932  0.000000  0.000636
     0.000772  0.000005  0.005484  0.003415  0.001460  0.000387  0.002323  0.000724  0.000663  0.000155
     0.003721  0.049421  0.001386  0.000200  0.016915  0.024850  0.022905  0.000039  0.016277  0.210408
  6  0.123635  0.229689  0.000000  0.001053  0.005758  0.073841  0.000000  0.001161  0.000000  0.001196
     0.002403  0.000004  0.009670  0.002798  0.000028  0.000338  0.013974  0.000398  0.004813  0.000302
     0.000636  0.028477  0.001171  0.000459  0.015202  0.019461  0.014125  0.000220  0.013528  0.096967
  7  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
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 12  0.001148  0.006756  0.000000  0.000773  0.003561  0.004134  0.000000  0.002141  0.000000  0.027931
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 14  0.000721  0.006655  0.000000  0.000861  0.003831  0.002507  0.000000  0.000214  0.000000  0.000124
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 15  0.001107  0.001697  0.000000  0.014519  0.072104  0.005997  0.000000  0.000385  0.000000  0.000136
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 23  0.002298  0.004980  0.000000  0.010440  0.069557  0.011418  0.000000  0.001499  0.000000  0.000797
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25	0.001841	0.005744	0.000000	0.002191	0.050740	0.004485	0.000000	0.002802	0.000000	0.001560
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	0.039423	0.023829	0.001299	0.000807	0.006955	0.013045	0.006041	0.000020	0.025071	0.085424
26	0.000631	0.001342	0.000000	0.000637	0.004037	0.002285	0.000000	0.000380	0.000000	0.000140
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	0.001201	0.070678	0.000117	0.000184	0.028880	0.070307	0.006801	0.000051	0.014616	0.116942
27	0.000742	0.001245	0.000000	0.066433	0.254516	0.003212	0.000000	0.000577	0.000000	0.000245
	0.000689	0.000006	0.001658	0.002515	0.000383	0.000606	0.001634	0.000814	0.000299	0.000152
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28	0.001378	0.001233	0.000000	0.002070	0.009338	0.003877	0.000000	0.000470	0.000000	0.000214
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30	0.003172	0.003481	0.000000	0.000640	0.004606	0.011491	0.000000	0.001550	0.000000	0.000560
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 5  0.000322  0.001438  0.001057  0.000000  0.002210  0.001839  0.000000  0.000021  0.000001  0.000010
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25  0.000442  0.001188  0.000273  0.000000  0.067934  0.001358  0.000000  0.000023  0.000001  0.000035
    0.015442  0.000111  0.000430  0.001133  0.000013  0.000000  0.019065  0.000016  0.000134  0.000000
    0.029885  0.004772  0.004811  0.000474  0.007170  0.016760  0.005360  0.000084  0.027783  0.104784
26  0.000203  0.001008  0.000482  0.000000  0.001968  0.001105  0.000000  0.000016  0.000000  0.000019
    0.000566  0.000005  0.000354  0.002817  0.000000  0.000000  0.001310  0.000014  0.002940  0.000000
    0.000887  0.021245  0.000398  0.000143  0.026948  0.109493  0.008544  0.000323  0.022790  0.155180
27  0.000072  0.000234  0.000098  0.000000  0.003748  0.000514  0.000000  0.000006  0.000000  0.000003
    0.000856  0.000008  0.000094  0.000629  0.000001  0.000000  0.001162  0.000003  0.000027  0.000000
    0.001681  0.073793  0.000450  0.000050  0.055325  0.005353  0.003180  0.000015  0.008228  0.035707
28  0.000295  0.000594  0.000700  0.000000  0.001109  0.001295  0.000000  0.000028  0.000001  0.000009
    0.000281  0.000003  0.000376  0.002384  0.000000  0.000000  0.000937  0.000018  0.000091  0.000000
    0.000501  0.014257  0.000365  0.000108  0.014829  0.021226  0.022601  0.001414  0.038361  0.226693
29  0.002756  0.001398  0.000830  0.000000  0.001124  0.001398  0.000000  0.000719  0.000000  0.000126
    0.000443  0.000003  0.003632  0.002272  0.000000  0.000000  0.002318  0.000012  0.000179  0.000000
    0.000488  0.005859  0.000282  0.000098  0.014514  0.044295  0.022513  0.000342  0.015671  0.143716
30  0.001144  0.002458  0.000986  0.000000  0.003529  0.005418  0.000000  0.000060  0.000003  0.000032
    0.000952  0.000008  0.001362  0.011946  0.000001  0.000000  0.003986  0.000091  0.000346  0.000000
    0.001530  0.003740  0.001267  0.000508  0.049424  0.070242  0.007490  0.000307  0.082423  0.151042
```

APPENDIX C9

DESCRIPTION OF DATA FILES

FILE 9
INTERREGIONAL (NATIONAL) MATRIX

C9 - INTERREGIONAL (NATIONAL) MATRIX FILE

File Name: NATIONAL.I-O

```
Sector Name* (string) -------------------------------->
                                                       >
                                                       > repeat
Factor, region 1 (real) ----------------->             > for each
Factor, region 2 (real)                    > repeat    > of the
       .                                   > for each  > 30 major
       .                                   > region    > industrial
       .                                   > + 1       > sectors
Factor, region N** (real)                  >           >
Factor, region N+1 (real) --------------> ------------->
```

<u>Notes</u>: - The order of the regions must be the same as that defined in this example. The order defined for the five economic regions is as follows

(1) British Columbia
(2) Prairies
(3) Ontario
(4) Quebec
(5) Atlantic.

- There is always one more factor than the number of regions to account for the effects of imports and exports.

- The 'columns' of the file represent the various regions and the 'rows' represent the contribution of each of the other regions.

- The sum of the 'columns' in a sector must be 1.0.

---

* List of industrial sectors provided in Table 2.1.

**'N' is the number of regions as defined in the general data base file.

file: NATIONAL.I-O

__Note__: This data file is valid for only 5 economic regions
(BC, Prairies, Ontario, Quebec, Atlantic).

```
'Sector  1 - Agriculture'
 .7136, .0107, .0036, .0008, .0006, .0092
 .0978, .9139, .1727, .0848, .0821, .9417
 .0035, .0012, .6889, .1236, .0788, .0396
 .0000, .0002, .0131, .6258, .0166, .0035
 .0000, .0001, .0069, .0210, .7010, .0061
 .1851, .0740, .1147, .1441, .1209, .0000
'Sector  2 - Forestry'
 .9612, .0350, .0027, .0007, .0001, .4610
 .0003, .8846, .0004, .0000, .0000, .0889
 .0001, .0026, .8640, .0010, .0000, .1235
 .0000, .0002, .0045, .8882, .0070, .0853
 .0000, .0000, .0002, .0002, .9735, .2412
 .0384, .0775, .1283, .1099, .0194, .0000
'Sector  3 - Metal Mines'
 .4510, .0260, .0000, .0588, .0000, .3907
 .0033, .9655, .0156, .0511, .0000, .0188
 .0342, .0000, .8643, .2493, .0000, .2358
 .0000, .0000, .0782, .3585, .3602, .0985
 .0277, .0000, .0000, .0273, .0918, .2563
 .4837, .0085, .0420, .2550, .5480, .0000
'Sector  4 - Mineral Fuels'
 .3729, .0003, .0002, .0000, .0000, .0948
 .6269, .9984, .7730, .0738, .0171, .8950
 .0001, .0001, .0022, .0001, .0000, .0103
 .0000, .0000, .0000, .0000, .0001, .0000
 .0000, .0000, .0007, .0015, .0198, .0000
 .0000, .0012, .2239, .9246, .9630, .0000
'Sector  5 - Non-Metal Mines'
 .6979, .0017, .0004, .0030, .0001, .1289
 .0313, .9413, .0171, .0092, .0183, .1775
 .0004, .0003, .7149, .0417, .0129, .0218
 .0593, .0115, .0691, .7528, .0048, .5849
 .0000, .0000, .0003, .0469, .7249, .0869
 .2111, .0453, .1982, .1465, .2390, .0000
'Sector  6 - Food & Beverages'
 .4714, .0687, .0082, .0054, .0051, .1402
 .2198, .6755, .0372, .0888, .0436, .1268
 .1221, .1332, .7377, .1482, .2092, .3146
 .0409, .0553, .0886, .6393, .1258, .2286
 .0041, .0060, .0241, .0247, .5129, .1898
 .1417, .0613, .1043, .0935, .1035, .0000
'Sector  7 - Tobacco'
 .0000, .0000, .0000, .0000, .0000, .0000
 .0000, .0000, .0000, .0000, .0000, .0000
 .5137, .4629, .4957, .5376, .3140, .9749
 .4687, .5325, .4559, .4140, .6771, .0251
 .0000, .0000, .0000, .0000, .0000, .0000
 .0176, .0046, .0484, .0484, .0089, .0000
'Sector  8 - Rubber & Plastics'
 .1194, .0098, .0015, .0010, .0039, .0028
 .0532, .1968, .0068, .0083, .0047, .0376
 .2490, .3117, .5176, .3371, .3592, .5621
 .0646, .1054, .0956, .4035, .2013, .1759
 .0000, .0004, .0077, .0341, .0861, .2216
 .5137, .3758, .3708, .2160, .3449, .0000
'Sector  9 - Leather'
 .0518, .0095, .0030, .0012, .0017, .0000
 .0245, .0853, .0387, .0098, .0044, .1764
 .1947, .2251, .5222, .2411, .2433, .6036
 .1793, .2194, .2413, .4072, .2855, .2200
 .0007, .0005, .0015, .0001, .0678, .0000
 .5489, .4603, .1934, .3406, .3971, .0000
'Sector 10 - Textiles'
 .1001, .0261, .0035, .0020, .0043, .0289
 .0501, .1602, .0176, .0141, .0280, .0654
 .1837, .1780, .3475, .1495, .1787, .2852
 .3342, .3702, .3635, .5477, .4400, .6131
 .0070, .0060, .0123, .0061, .0351, .0075
 .3248, .2596, .2557, .2806, .3139, .0000
'Sector 11 - Wood'
 .6381, .3267, .1233, .0746, .0877, .7666
 .0420, .4994, .0264, .0110, .0179, .0333
 .0046, .0334, .5541, .0712, .0579, .0676
 .0068, .0282, .1272, .6648, .1369, .1041
 .0000, .0003, .0141, .0145, .6462, .0285
 .1083, .1120, .1549, .1639, .0533, .0000
'Sector 12 - Furniture'
 .3391, .0129, .0031, .0000, .0001, .0087
 .0557, .3806, .0089, .0032, .0021, .0133
 .2146, .2908, .6822, .2703, .3244, .5949
 .1230, .1722, .1842, .6299, .3124, .3679
 .0028, .0023, .0026, .0034, .1409, .0152
 .2648, .1412, .1190, .0931, .2201, .0000
'Sector 13 - Paper'
 .5805, .1951, .0031, .0041, .0200, .3128
 .0527, .3210, .0101, .0137, .0016, .0448
 .1119, .2693, .6415, .1862, .1902, .1916
 .0415, .0817, .2195, .6867, .3093, .2600
 .0053, .0059, .0201, .0309, .3369, .1909
 .2080, .1271, .1057, .0783, .1421, .0000
'Sector 14 - Printing'
 .5992, .0137, .0006, .0013, .0017, .0147
 .0185, .6013, .0046, .0008, .0042, .0308
 .1472, .1415, .8038, .0927, .2119, .6201
 .0457, .0610, .0643, .7647, .2450, .3341
 .0000, .0000, .0000, .0000, .3706, .0003
 .1894, .1825, .1267, .1406, .1666, .0000
'Sector 15 - Primary Metals'
 .2230, .0602, .0070, .0090, .0005, .0882
 .1533, .3114, .0060, .0382, .0047, .0853
 .1628, .3182, .5919, .2810, .3456, .4605
 .0342, .0637, .1257, .4039, .1970, .3494
 .0031, .0090, .0115, .0209, .1389, .0167
 .4235, .2374, .2578, .2470, .3132, .0000
'Sector 16 - Primary Metals'
 .2230, .0602, .0070, .0090, .0005, .0882
 .1533, .3114, .0060, .0382, .0047, .0853
 .1628, .3182, .5919, .2810, .3456, .4605
 .0342, .0637, .1257, .4039, .1970, .3494
 .0031, .0090, .0115, .0209, .1389, .0167
 .4235, .2374, .2578, .2470, .3132, .0000
'Sector 17 - Metal Fabricating'
 .3954, .0578, .0021, .0033, .0072, .0454
 .0398, .3518, .0082, .0032, .0029, .0542
 .2333, .3018, .6904, .2540, .3663, .6192
 .0684, .0835, .0861, .5197, .2065, .2657
 .0014, .0017, .0008, .0022, .2211, .0155
 .2616, .2034, .2124, .2176, .1960, .0000
'Sector 18 - Machinery'
 .2250, .0090, .0035, .0034, .0057, .0453
 .0195, .1569, .0043, .0030, .0034, .0946
 .1243, .1295, .3005, .1307, .2121, .7485
 .0327, .0156, .0241, .2246, .0816, .0912
 .0004, .0003, .0003, .0020, .0786, .0204
 .5981, .6887, .6673, .6363, .6185, .0000
'Sector 19 - Transportation Equip.'
 .1762, .0394, .0031, .0054, .0051, .0147
 .0374, .1417, .0042, .0029, .0023, .0108
 .1421, .2809, .2650, .1903, .1961, .8475
 .0213, .0212, .0250, .1662, .0729, .1184
 .0048, .0043, .0060, .0124, .1902, .0086
 .6183, .5125, .6967, .6229, .5334, .0000
'Sector 20 - Electrical Products'
 .1494, .0178, .0013, .0013, .0082, .0098
 .0208, .1261, .0050, .0034, .0070, .0068
 .3100, .3643, .5059, .3955, .3872, .6911
 .0854, .1072, .1119, .3009, .1515, .2849
 .0017, .0031, .0038, .0036, .1117, .0075
 .4327, .3616, .3722, .2953, .3343, .0000
'Sector 21 - Non-Metallic Minerals'
 .5640, .0335, .0010, .0004, .0000, .0452
 .1108, .6421, .0060, .0019, .0009, .0193
 .0661, .1481, .7474, .1525, .1807, .6318
 .0231, .0377, .0488, .6857, .1434, .3005
 .0000, .0000, .0008, .0018, .5523, .0032
 .2360, .1387, .1961, .1577, .1227, .0000
'Sector 22 - Petroleum & Coal'
 .5830, .0183, .0005, .0007, .0004, .0107
 .1202, .7210, .0248, .0198, .0014, .2877
 .1357, .1493, .7185, .1308, .1249, .1852
 .0376, .0358, .1276, .6531, .1497, .1635
 .0030, .0003, .0061, .0547, .6534, .3528
 .1205, .0755, .1227, .1408, .0702, .0000
'Sector 23 - Chemicals'
 .2889, .0253, .0006, .0000, .0000, .0309
 .0657, .4067, .0141, .0081, .0027, .4047
 .1933, .2112, .4457, .2983, .3254, .3390
 .1057, .1022, .1493, .3559, .2191, .1614
 .0000, .0000, .0102, .0063, .2148, .0640
 .3465, .2545, .3800, .3314, .2379, .0000
'Sector 24 - Misc. Manufacturing'
 .1546, .0055, .0001, .0002, .0004, .0017
 .0110, .1446, .0013, .0004, .0012, .0161
 .2374, .3251, .3799, .1993, .3363, .7426
 .0610, .1036, .0487, .2961, .1533, .2284
 .0034, .0035, .0017, .0026, .1026, .0112
 .5326, .4178, .5684, .5012, .4040, .0000
'Sector 25 - Construction'
1.0000, .0000, .0000, .0000, .0000, .0000
 .0000,1.0000, .0000, .0000, .0000, .0000
 .0000, .0000,1.0000, .0000, .0000, .0000
 .0000, .0000, .0000,1.0000, .0000, .0000
 .0000, .0000, .0000, .0000,1.0000, .0000
 .0000, .0000, .0000, .0000, .0000,1.0000
'Sector 26 - Transportation'
1.0000, .0000, .0000, .0000, .0000, .0000
 .0000,1.0000, .0000, .0000, .0000, .0000
 .0000, .0000,1.0000, .0000, .0000, .0000
 .0000, .0000, .0000,1.0000, .0000, .0000
 .0000, .0000, .0000, .0000,1.0000, .0000
 .0000, .0000, .0000, .0000, .0000,1.0000
'Sector 27 - Electric Power'
 .9993, .0007, .0000, .0000, .0000, .0694
 .0006, .9992, .0064, .0000, .0000, .0682
 .0000, .0000, .9423, .0000, .0000, .6228
 .0000, .0000, .0466, .8982, .0655, .0652
 .0000, .0000, .0000, .1018, .9344, .1744
 .0001, .0000, .0047, .0001, .0001, .0000
'Sector 28 - Other Utilities'
1.0000, .0000, .0000, .0000, .0000, .0000
 .0000,1.0000, .0000, .0000, .0000, .0000
 .0000, .0000,1.0000, .0000, .0000, .0000
 .0000, .0000, .0000,1.0000, .0000, .0000
 .0000, .0000, .0000, .0000,1.0000, .0000
 .0000, .0000, .0000, .0000, .0000,1.0000
'Sector 29 - Trade'
1.0000, .0000, .0000, .0000, .0000, .0000
 .0000,1.0000, .0000, .0000, .0000, .0000
 .0000, .0000,1.0000, .0000, .0000, .0000
 .0000, .0000, .0000,1.0000, .0000, .0000
 .0000, .0000, .0000, .0000,1.0000, .0000
 .0000, .0000, .0000, .0000, .0000,1.0000
'Sector 30 - Other'
1.0000, .0000, .0000, .0000, .0000, .0000
 .0000,1.0000, .0000, .0000, .0000, .0000
 .0000, .0000,1.0000, .0000, .0000, .0000
 .0000, .0000, .0000,1.0000, .0000, .0000
 .0000, .0000, .0000, .0000,1.0000, .0000
 .0000, .0000, .0000, .0000, .0000,1.0000
```

APPENDIX C10

DESCRIPTION OF DATA FILES

FILE 10
IRRIGATION AREA DATA

C10 - IRRIGATION AREA DATA FILE

File Name: Ixxxxxx.DAT

```
descriptor (string)
Area Name (50-character string)

descriptor (string)
Number of Development Scenarios (integer)

descriptor (string) ----------------------------------->
Development Year (integer)                             >
                                                       >
descriptor (string)                                    >
Scenario Description (25-character string)             >
                                                       >
descriptor (string)                                    >
Total Irrigated Area (integer), ha                     >
                                                       >
descriptor (string)                                    >
System Delivery Efficiency (real), %                   >
                                                       >
descriptor (string)                                    >
Delivery Evaporative Losses (real), %                  >
                                                       > repeat
descriptor (string)                                    > for each
Monthly Irrigation Water Salinity* (real),             > scenario
  mmhos/cm                                             >
                                                       >
descriptor (string)                                    >
Fraction of Demand from Groundwater* (real)            >
                                                       >
                                                       >
descriptor (string)                                    >
Monthly Off-Stream Storage** (real), %                 >
                                                       >
descriptor (string)                                    >
Number of Crop Types (integer)                         >
                                                       >
```

---

* One value for each month.

**One percentage for each month (which must either be zero or sum to 100).

```
Crop Code (integer) --------------------> repeat      >
Crop Area (real), % of total area       > for each    >
Crop Level of Irrigation (real), % ------> crop type   >
                                                      > repeat
descriptor (string)                                   > for each
Number of Soil Types (integer)                        > scenario
                                                      >
Soil Code (integer) --------------------> repeat for  >
Soil Area (real), % of total area -------> each soil   >
                                                      >
descriptor (string)                                   >
Number of Irrigation Types (integer)                  >
                                                      >
Irrigation Type Code (integer) ---------> repeat      >
Area (real), % of total area            > for each    >
Application Efficiency (real), %        > irrigation  >
Adjustment Factor for level of          > type        >
  irrigation (real) -------------------->              >
                                                      >
descriptor (string)                                   >
In-Season Rainfall Application Efficiency             >
  (real), % ------------------------------------------>
```

file: IAREA1.DAT

```
'Description'     'IRRIGATION AREA 1'
'No. of Scenarios' 1

'Development Year'      1987
'Description'          '1987 TEST CASE SCENARIO'
'Total Area'             400
'Delivery Efficiency'     85.
'Delivery Evap. Losses'  15.
'Water Salinity'         .00 .00 .00 .00 .368 .350 .330 .332 .347 .00 .00 .00
'Groundwater Fraction'  .00 .00 .00 .00 .00  .00  .00  .00  .00  .00 .00 .00
'Off-Stream Storage'    0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
'No. of Crops'         3
                       1 45. 50.
                       2 45. 50.
                       3 10. 50.
'No. of Soils'         2
                       2 50.
                       3 50.
'No. of Irrgn Types'   4
                       1 10. 55. 1.20
                       2 10. 60. 1.20
                       3 40. 70. 1.10
                       4 40. 80. 1.00
'Rainfall Application Efficiency' 75.
```

file: IAREA2.DAT

```
'Description'      'IRRIGATION AREA 2'
'No. of Scenarios'  1

'Development Year'      1987
'Description'          '1987 TEST CASE SCENARIO'
'Total Area'             800
'Delivery Efficiency'     85.
'Delivery Evap. Losses'  15.
'Water Salinity'         .00 .00 .00 .00 .368 .350 .330 .332 .347 .00 .00 .00
'Groundwater Fraction'  .00 .00 .00 .00 .00  .00  .00  .00  .00  .00 .00 .00
'Off-Stream Storage'    0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
'No. of Crops'         3
                       1 45. 50.
                       2 45. 50.
                       3 10. 50.
'No. of Soils'         2
                       2 50.
                       3 50.
'No. of Irrgn Types'   4
                       1 10. 55. 1.20
                       2 10. 60. 1.20
                       3 40. 70. 1.10
                       4 40. 80. 1.00
'Rainfall Application Efficiency' 80.
```

file: IAREA3.DAT

```
'Description'      'IRRIGATION AREA 3'
'No. of Scenarios' 1

'Development Year'     1987
'Description'         '1987 TEST CASE SCENARIO'
'Total Area'           10450
'Delivery Efficiency'    85.
'Delivery Evap. Losses'  15.
'Water Salinity'         .00 .00 .00 .00 .368 .350 .330 .332 .347 .00 .00 .00
'Groundwater Fraction'   .00 .00 .00 .00 .00  .00  .00  .00  .00  .00 .00 .00
'Off-Stream Storage'    0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
'No. of Crops'         3
                       1 45. 50.
                       2 45. 50.
                       3 10. 50.
'No. of Soils'         2
                       2 50.
                       3 50.
'No. of Irrgn Types'   4
                       1 10. 55. 1.20
                       2 10. 60. 1.20
                       3 40. 70. 1.10
                       4 40. 80. 1.00
'Rainfall Application Efficiency' 95.
```

file: IAREA4.DAT

```
'Description'      'IRRIGATION AREA 4'
'No. of Scenarios' 1

'Development Year'     1987
'Description'         '1987 TEST CASE SCENARIO'
'Total Area'           400
'Delivery Efficiency'    85.
'Delivery Evap. Losses'  15.
'Water Salinity'         .00 .00 .00 .00 .368 .350 .330 .332 .347 .00 .00 .00
'Groundwater Fraction'   .00 .00 .00 .00 .00  .00  .00  .00  .00  .00 .00 .00
'Off-Stream Storage'    0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
'No. of Crops'         3
                       1 45. 50.
                       2 45. 50.
                       3 10. 50.
'No. of Soils'         2
                       2 50.
                       3 50.
'No. of Irrgn Types'   4
                       1 10. 55. 1.20
                       2 10. 60. 1.20
                       3 40. 70. 1.10
                       4 40. 80. 1.00
'Rainfall Application Efficiency' 80.
```

file: IAREA5.DAT

```
'Description'      'IRRIGATION AREA 5'
'No. of Scenarios'  1

'Development Year'     1987
'Description'         '1987 TEST CASE SCENARIO'
'Total Area'           12000
'Delivery Efficiency'    85.
'Delivery Evap. Losses'  15.
'Water Salinity'         .00 .00 .00 .00 .368 .350 .330 .332 .347 .00 .00 .00
'Groundwater Fraction'  .00 .00 .00 .00 .00  .00  .00  .00  .00  .00 .00 .00
'Off-Stream Storage'    0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
'No. of Crops'         3
                       1 45. 50.
                       2 45. 50.
                       3 10. 50.
'No. of Soils'         2
                       2 50.
                       3 50.
'No. of Irrgn Types'   4
                       1 10. 55. 1.20
                       2 10. 60. 1.20
                       3 40. 70. 1.10
                       4 40. 80. 1.00
'Rainfall Application Efficiency' 95.
```

file: IAREA6.DAT

```
'Description'      'IRRIGATION AREA 6'
'No. of Scenarios'  1

'Development Year'     1987
'Description'         '1987 TEST CASE SCENARIO'
'Total Area'           25800
'Delivery Efficiency'    65.
'Delivery Evap. Losses'  25.
'Water Salinity'         .00 .00 .00 .00 .318 .287 .289 .296 .319 .00 .00 .00
'Groundwater Fraction'  .00 .00 .00 .00 .00  .00  .00  .00  .00  .00 .00 .00
'Off-Stream Storage'    0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
'No. of Crops'         3
                       1 38.6 50.
                       2 52.4 50.
                       3  9.0 50.
'No. of Soils'         1
                       3 100.
'No. of Irrgn Types'   4
                       1  8. 55. 1.20
                       2  8. 60. 1.20
                       3 30. 70. 1.10
                       4 54. 80. 1.00
'Rainfall Application Efficiency' 80.
```

file: IAREA7.DAT

```
'Description'      'IRRIGATION AREA 7'
'No. of Scenarios'  1

'Development Year'     1987
'Description'         '1987 TEST CASE SCENARIO'
'Total Area'           108400
'Delivery Efficiency'    70.
'Delivery Evap. Losses'  15.
'Water Salinity'        .00 .00 .00 .00 .318 .287 .289 .296 .319 .00 .00 .00
'Groundwater Fraction'  .00 .00 .00 .00 .00  .00  .00  .00  .00  .00 .00 .00
'Off-Stream Storage'    0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
'No. of Crops'        3
                      1 56.0 40.
                      2 41.1 40.
                      3  2.9 40.
'No. of Soils'        2
                      2 25.
                      4 75.
'No. of Irrgn Types'  4
                      1 18. 55. 1.20
                      2 18. 60. 1.20
                      3 40. 70. 1.10
                      4 24. 80. 1.00
'Rainfall Application Efficiency' 95.
```

APPENDIX C11

DESCRIPTION OF DATA FILES

FILE 11
PRECIPITATION DATA

C11 - PRECIPITATION DATA FILE
File Name: Pxxxxxx.DAT

Number of Years (integer)

```
Year* (integer) -------------------------------------> repeat for
Precipitation** (real), mm --------------------------> each year
```

9999

---

* Years must be in sequential order; there cannot be gaps.

**One value for each month.

file: PGAGE_P1.DAT

```
  10
1912  12.0   2.0   9.0  41.0  31.0  31.0  72.0  15.0   9.0   6.0   8.0   0.0
1913  46.0  12.0  13.0   6.0  29.0 132.0  29.0  60.0   7.0   5.0  24.0   0.0
1914  20.0  22.0  11.0  19.0  10.0  76.0  28.0  44.0  30.0  46.0  25.0  14.0
1915  11.0  11.0   1.0   2.0  87.0 121.0 124.0  38.0  66.0  19.0   8.0   5.0
1916  25.0   5.0  13.0  10.0  64.0  64.0  78.0  83.0  14.0  28.0  76.0  76.0
1917   5.0   5.0   5.0   6.0  53.0  38.0  12.0  45.0  23.0  20.0   0.0  30.0
1918  13.0  12.0  18.0   6.0  20.0   6.0  28.0  39.0  15.0   0.0   4.0  20.0
1919   2.0  19.0  21.0  52.0   7.0  18.0  44.0  48.0  51.0  23.0  33.0   6.0
1920  39.0  41.0  11.0  27.0  33.0  40.0  54.0   6.0   0.0  13.0   4.0  11.0
1921  19.0   8.0  26.0  57.0  43.0  12.0 114.0  74.0  36.0  10.0  42.0   1.0
9999
```

file: PGAGE_P2.DAT

```
  10
1912  18.0   5.0   8.0  19.0  72.0  30.0  22.0  16.0  45.0   9.0   8.0   2.0
1913  10.0  28.0  27.0   0.0  27.0  95.0   7.0   2.0   0.0   1.0  22.0   5.0
1914  27.0  24.0  11.0   1.0   2.0  52.0  15.0  40.0  26.0  53.0  17.0  28.0
1915  15.0  31.0   5.0  11.0  75.0 138.0  39.0  53.0  17.0   7.0   3.0   7.0
1916   4.0  32.0   8.0   6.0  68.0  58.0  67.0  44.0  62.0  43.0   9.0  15.0
1917  11.0   8.0   4.0  21.0  26.0  23.0  27.0 111.0  21.0  12.0   3.0  61.0
1918  26.0  15.0  13.0   2.0  13.0  18.0  35.0  30.0   7.0   3.0   2.0  20.0
1919  10.0  18.0  32.0  52.0  84.0   8.0  41.0  49.0  46.0  19.0  32.0  19.0
1920  27.0   4.0  34.0  36.0  27.0  29.0  46.0   0.0   0.0  25.0   0.0   3.0
1921  15.0  33.0  65.0  25.0  42.0   8.0  38.0  33.0  65.0   6.0  31.0   2.0
9999
```

APPENDIX C12

DESCRIPTION OF DATA FILES

FILE 12
EVAPOTRANSPIRATION DATA

C12 - REFERENCE POTENTIAL EVAPOTRANSPIRATION DATA FILE

File Name: Exxxxx.DAT

Number of Years (integer)

```
Year* (integer) --------------------------------------> repeat for
Evapotranspiration** (real), mm ----------------------> each year
```

9999

---

* Years must be in sequential order; there cannot be gaps.

**One value for each month, although only the irrigation months are used in calculations.

file: EGAGE_E1.DAT

```
  10
1912 0, 0, 0, 0, 153.80, 173.00, 189.05, 176.90, 126.50, 0, 0, 0
1913 0, 0, 0, 0, 153.80, 173.00, 189.05, 176.90, 126.50, 0, 0, 0
1914 0, 0, 0, 0, 153.80, 173.00, 189.05, 176.90, 126.50, 0, 0, 0
1915 0, 0, 0, 0, 153.80, 173.00, 189.05, 176.90, 126.50, 0, 0, 0
1916 0, 0, 0, 0, 153.80, 173.00, 189.05, 176.90, 126.50, 0, 0, 0
1917 0, 0, 0, 0, 153.80, 173.00, 189.05, 176.90, 126.50, 0, 0, 0
1918 0, 0, 0, 0, 153.80, 173.00, 189.05, 176.90, 126.50, 0, 0, 0
1919 0, 0, 0, 0, 153.80, 173.00, 189.05, 176.90, 126.50, 0, 0, 0
1920 0, 0, 0, 0, 153.80, 173.00, 189.05, 176.90, 126.50, 0, 0, 0
1921 0, 0, 0, 0, 153.80, 173.00, 189.05, 176.90, 126.50, 0, 0, 0
9999
```

APPENDIX C13

DESCRIPTION OF DATA FILES

FILE 13
IRRIGATION AREA RUN DATA

C13 - IRRIGATION AREA RUN FILE

File Name: Ixxxxxx.RUN

Development Year (integer)

Number of Years of Data (integer)

Monthly Fraction from Groundwater* (real)

Year --> repeat
Monthly Flow Requirement** (real), Mm^3 > for each
Monthly Supply Flows* (real), Mm^3 > year
Monthly Return Flows* (real), Mm^3 -------------------->

9999

---

* One value for each irrigation month.

**One value for each month.

Note: The monthly flow requirement represents actual stream withdrawals each month (barring cutbacks); the monthly supply represents the amount needed in that month by the irrigation area. The difference between the two either goes to, or comes from, off-stream storage.

file: IAREA1.RUN

```
1999
  10
        0.000   0.000   0.000   0.000   0.000
1912    0.000   0.000   0.000   0.000   0.205   0.605   0.781   0.633   0.591   0.000   0.000   0.000
        0.205   0.605   0.781   0.633   0.591
        0.076   0.224   0.289   0.234   0.219
1913    0.000   0.000   0.000   0.000   0.205   0.324   0.781   0.498   0.566   0.000   0.000   0.000
        0.205   0.324   0.781   0.498   0.566
        0.076   0.120   0.289   0.184   0.209
1914    0.000   0.000   0.000   0.000   0.361   0.477   0.789   0.498   0.551   0.000   0.000   0.000
        0.361   0.477   0.789   0.498   0.551
        0.134   0.177   0.292   0.184   0.204
1915    0.000   0.000   0.000   0.000   0.167   0.317   0.490   0.489   0.327   0.000   0.000   0.000
        0.167   0.317   0.490   0.489   0.327
        0.062   0.117   0.181   0.181   0.121
1916    0.000   0.000   0.000   0.000   0.167   0.401   0.591   0.489   0.462   0.000   0.000   0.000
        0.167   0.401   0.591   0.489   0.462
        0.062   0.148   0.218   0.181   0.171
1917    0.000   0.000   0.000   0.000   0.167   0.416   0.911   0.498   0.585   0.000   0.000   0.000
        0.167   0.416   0.911   0.498   0.585
        0.062   0.154   0.337   0.184   0.216
1918    0.000   0.000   0.000   0.000   0.205   0.682   0.911   0.624   0.565   0.000   0.000   0.000
        0.205   0.682   0.911   0.624   0.565
        0.076   0.252   0.337   0.231   0.209
1919    0.000   0.000   0.000   0.000   0.205   0.682   0.903   0.489   0.494   0.000   0.000   0.000
        0.205   0.682   0.903   0.489   0.494
        0.076   0.252   0.334   0.181   0.183
1920    0.000   0.000   0.000   0.000   0.170   0.605   0.789   0.642   0.605   0.000   0.000   0.000
        0.170   0.605   0.789   0.642   0.605
        0.063   0.224   0.292   0.237   0.224
1921    0.000   0.000   0.000   0.000   0.170   0.612   0.696   0.489   0.413   0.000   0.000   0.000
        0.170   0.612   0.696   0.489   0.413
        0.063   0.226   0.257   0.181   0.153
9999
```

file: IAREA2.RUN

```
1999
  10
        0.000   0.000   0.000   0.000   0.000
1912    0.000   0.000   0.000   0.000   0.397   1.225   1.562   1.285   1.150   0.000   0.000   0.000
        0.397   1.225   1.562   1.285   1.150
        0.147   0.453   0.578   0.475   0.425
1913    0.000   0.000   0.000   0.000   0.397   0.635   1.562   0.996   1.085   0.000   0.000   0.000
        0.397   0.635   1.562   0.996   1.085
        0.147   0.235   0.578   0.368   0.401
1914    0.000   0.000   0.000   0.000   0.723   0.816   1.578   0.996   1.099   0.000   0.000   0.000
        0.723   0.816   1.578   0.996   1.099
        0.267   0.302   0.584   0.368   0.406
1915    0.000   0.000   0.000   0.000   0.334   0.394   0.809   0.978   0.736   0.000   0.000   0.000
        0.334   0.394   0.809   0.978   0.736
        0.123   0.146   0.299   0.362   0.272
1916    0.000   0.000   0.000   0.000   0.334   0.802   1.392   0.666   0.970   0.000   0.000   0.000
        0.334   0.802   1.392   0.666   0.970
        0.123   0.296   0.515   0.246   0.359
1917    0.000   0.000   0.000   0.000   0.334   0.955   1.821   0.978   1.163   0.000   0.000   0.000
        0.334   0.955   1.821   0.978   1.163
        0.123   0.353   0.673   0.362   0.430
1918    0.000   0.000   0.000   0.000   0.410   1.363   1.821   1.248   1.118   0.000   0.000   0.000
        0.410   1.363   1.821   1.248   1.118
        0.151   0.504   0.673   0.461   0.413
1919    0.000   0.000   0.000   0.000   0.410   1.363   1.805   0.996   0.957   0.000   0.000   0.000
        0.410   1.363   1.805   0.996   0.957
        0.151   0.504   0.667   0.368   0.354
1920    0.000   0.000   0.000   0.000   0.339   1.210   1.408   1.285   1.227   0.000   0.000   0.000
        0.339   1.210   1.408   1.285   1.227
        0.125   0.447   0.521   0.475   0.454
1921    0.000   0.000   0.000   0.000   0.339   1.225   1.392   0.978   0.795   0.000   0.000   0.000
        0.339   1.225   1.392   0.978   0.795
        0.125   0.453   0.515   0.362   0.294
9999
```

```
file:   IAREA3.RUN

1999
  10
        0.000   0.000   0.000   0.000   0.000
1912    0.000   0.000   0.000   0.000   5.189  15.806  18.397  13.012  16.364   0.000   0.000   0.000
        5.189  15.806  18.397  13.012  16.364
        1.919   5.844   6.802   4.811   6.051
1913    0.000   0.000   0.000   0.000   5.189   8.292  18.397  13.012  13.003   0.000   0.000   0.000
        5.189   8.292  18.397  13.012  13.003
        1.919   3.066   6.802   4.811   4.808
1914    0.000   0.000   0.000   0.000   5.350  10.474  23.578  13.012  12.788   0.000   0.000   0.000
        5.350  10.474  23.578  13.012  12.788
        1.978   3.873   8.718   4.811   4.728
1915    0.000   0.000   0.000   0.000   4.357   3.718   7.402  12.532   6.804   0.000   0.000   0.000
        4.357   3.718   7.402  12.532   6.804
        1.611   1.375   2.737   4.634   2.516
1916    0.000   0.000   0.000   0.000   4.357   8.472  13.005   4.937  13.883   0.000   0.000   0.000
        4.357   8.472  13.005   4.937  13.883
        1.611   3.133   4.809   1.826   5.133
1917    0.000   0.000   0.000   0.000   4.357  10.665  23.578  13.012  14.020   0.000   0.000   0.000
        4.357  10.665  23.578  13.012  14.020
        1.611   3.944   8.718   4.811   5.184
1918    0.000   0.000   0.000   0.000   5.189  15.998  25.800  13.012  15.357   0.000   0.000   0.000
        5.189  15.998  25.800  13.012  15.357
        1.919   5.915   9.539   4.811   5.678
1919    0.000   0.000   0.000   0.000   9.439  15.998  20.619  13.012  11.200   0.000   0.000   0.000
        9.439  15.998  20.619  13.012  11.200
        3.490   5.915   7.624   4.811   4.141
1920    0.000   0.000   0.000   0.000   4.431  10.665  20.408  16.780  16.722   0.000   0.000   0.000
        4.431  10.665  20.408  16.780  16.722
        1.638   3.944   7.546   6.205   6.183
1921    0.000   0.000   0.000   0.000   4.357  15.998  15.016  12.532   9.254   0.000   0.000   0.000
        4.357  15.998  15.016  12.532   9.254
        1.611   5.915   5.552   4.634   3.422
9999
```

```
file:   IAREA4.RUN

1999
  10
        0.000   0.000   0.000   0.000   0.000
1912    0.000   0.000   0.000   0.000   0.199   0.612   0.781   0.642   0.575   0.000   0.000   0.000
        0.199   0.612   0.781   0.642   0.575
        0.073   0.226   0.289   0.237   0.213
1913    0.000   0.000   0.000   0.000   0.199   0.317   0.781   0.498   0.543   0.000   0.000   0.000
        0.199   0.317   0.781   0.498   0.543
        0.073   0.117   0.289   0.184   0.201
1914    0.000   0.000   0.000   0.000   0.361   0.408   0.789   0.498   0.549   0.000   0.000   0.000
        0.361   0.408   0.789   0.498   0.549
        0.134   0.151   0.292   0.184   0.203
1915    0.000   0.000   0.000   0.000   0.167   0.197   0.405   0.489   0.368   0.000   0.000   0.000
        0.167   0.197   0.405   0.489   0.368
        0.062   0.073   0.150   0.181   0.136
1916    0.000   0.000   0.000   0.000   0.167   0.401   0.696   0.333   0.485   0.000   0.000   0.000
        0.167   0.401   0.696   0.333   0.485
        0.062   0.148   0.257   0.123   0.179
1917    0.000   0.000   0.000   0.000   0.167   0.477   0.911   0.489   0.581   0.000   0.000   0.000
        0.167   0.477   0.911   0.489   0.581
        0.062   0.177   0.337   0.181   0.215
1918    0.000   0.000   0.000   0.000   0.205   0.682   0.911   0.624   0.559   0.000   0.000   0.000
        0.205   0.682   0.911   0.624   0.559
        0.076   0.252   0.337   0.231   0.207
1919    0.000   0.000   0.000   0.000   0.205   0.682   0.903   0.498   0.478   0.000   0.000   0.000
        0.205   0.682   0.903   0.498   0.478
        0.076   0.252   0.334   0.184   0.177
1920    0.000   0.000   0.000   0.000   0.170   0.605   0.704   0.642   0.613   0.000   0.000   0.000
        0.170   0.605   0.704   0.642   0.613
        0.063   0.224   0.260   0.237   0.227
1921    0.000   0.000   0.000   0.000   0.170   0.612   0.696   0.489   0.397   0.000   0.000   0.000
        0.170   0.612   0.696   0.489   0.397
        0.063   0.226   0.257   0.181   0.147
9999
```

file: IAREA5.RUN

```
1999
  10
       0.000    0.000    0.000    0.000    0.000
1912   0.000    0.000    0.000    0.000    5.959   18.151   21.126   14.942   18.791    0.000    0.000    0.000
       5.959   18.151   21.126   14.942   18.791
       2.203    6.711    7.811    5.525    6.948
1913   0.000    0.000    0.000    0.000    5.959    9.521   21.126   14.942   14.932    0.000    0.000    0.000
       5.959    9.521   21.126   14.942   14.932
       2.203    3.521    7.811    5.525    5.521
1914   0.000    0.000    0.000    0.000    6.144   12.027   27.075   14.942   14.684    0.000    0.000    0.000
       6.144   12.027   27.075   14.942   14.684
       2.272    4.447   10.011    5.525    5.430
1915   0.000    0.000    0.000    0.000    5.003    4.270    8.500   14.391    7.814    0.000    0.000    0.000
       5.003    4.270    8.500   14.391    7.814
       1.850    1.579    3.143    5.321    2.889
1916   0.000    0.000    0.000    0.000    5.003    9.729   14.934    5.670   15.942    0.000    0.000    0.000
       5.003    9.729   14.934    5.670   15.942
       1.850    3.597    5.522    2.096    5.895
1917   0.000    0.000    0.000    0.000    5.003   12.247   27.075   14.942   16.099    0.000    0.000    0.000
       5.003   12.247   27.075   14.942   16.099
       1.850    4.528   10.011    5.525    5.953
1918   0.000    0.000    0.000    0.000    5.959   18.371   29.626   14.942   17.635    0.000    0.000    0.000
       5.959   18.371   29.626   14.942   17.635
       2.203    6.793   10.954    5.525    6.520
1919   0.000    0.000    0.000    0.000   10.839   18.371   23.677   14.942   12.861    0.000    0.000    0.000
      10.839   18.371   23.677   14.942   12.861
       4.008    6.793    8.755    5.525    4.755
1920   0.000    0.000    0.000    0.000    5.088   12.247   23.435   19.269   19.203    0.000    0.000    0.000
       5.088   12.247   23.435   19.269   19.203
       1.881    4.528    8.665    7.125    7.100
1921   0.000    0.000    0.000    0.000    5.003   18.371   17.243   14.391   10.626    0.000    0.000    0.000
       5.003   18.371   17.243   14.391   10.626
       1.850    6.793    6.376    5.321    3.929
9999
```

file: IAREA6.RUN

```
1999
  10
       0.000    0.000    0.000    0.000    0.000
1912   0.000    0.000    0.000    0.000   19.374   55.922   62.972   45.438   53.281    0.000    0.000    0.000
      19.374   55.922   62.972   45.438   53.281
       8.436   24.349   27.418   19.784   23.199
1913   0.000    0.000    0.000    0.000   19.374   30.690   62.972   44.706   45.453    0.000    0.000    0.000
      19.374   30.690   62.972   44.706   45.453
       8.436   13.362   27.418   19.465   19.790
1914   0.000    0.000    0.000    0.000   19.864   37.086   69.466   45.438   49.724    0.000    0.000    0.000
      19.864   37.086   69.466   45.438   49.724
       8.649   16.147   30.246   19.784   21.650
1915   0.000    0.000    0.000    0.000   16.995   18.289   37.008   44.706   29.288    0.000    0.000    0.000
      16.995   18.289   37.008   44.706   29.288
       7.400    7.963   16.113   19.465   12.752
1916   0.000    0.000    0.000    0.000   16.995   31.823   50.640   32.208   43.224    0.000    0.000    0.000
      16.995   31.823   50.640   32.208   43.224
       7.400   13.856   22.049   14.023   18.820
1917   0.000    0.000    0.000    0.000   16.995   37.672   69.466   45.438   50.923    0.000    0.000    0.000
      16.995   37.672   69.466   45.438   50.923
       7.400   16.402   30.246   19.784   22.172
1918   0.000    0.000    0.000    0.000   19.864   55.922   81.154   44.706   52.282    0.000    0.000    0.000
      19.864   55.922   81.154   44.706   52.282
       8.649   24.349   35.334   19.465   22.764
1919   0.000    0.000    0.000    0.000   19.864   56.508   68.821   45.438   44.052    0.000    0.000    0.000
      19.864   56.508   68.821   45.438   44.052
       8.649   24.604   29.965   19.784   19.180
1920   0.000    0.000    0.000    0.000   17.204   42.936   62.972   60.108   54.038    0.000    0.000    0.000
      17.204   42.936   62.972   60.108   54.038
       7.491   18.694   27.418   26.171   23.528
1921   0.000    0.000    0.000    0.000   17.204   55.922   49.995   43.973   36.801    0.000    0.000    0.000
      17.204   55.922   49.995   43.973   36.801
       7.491   24.349   21.768   19.146   16.023
9999
```

```
file:  IAREA7.RUN


1999
  10
       0.000   0.000   0.000   0.000   0.000
1912   0.000   0.000   0.000   0.000  52.853 136.408 274.440 201.797 168.237   0.000   0.000   0.000
      52.853 136.408 274.440 201.797 168.237
      25.353  65.435 131.649  96.802  80.703
1913   0.000   0.000   0.000   0.000  64.561 105.588 274.440 202.704 219.756   0.000   0.000   0.000
      64.561 105.588 274.440 202.704 219.756
      30.970  50.655 131.649  97.237 105.417
1914   0.000   0.000   0.000   0.000 129.122 165.767 275.239 158.862 184.174   0.000   0.000   0.000
     129.122 165.767 275.239 158.862 184.174
      61.940  79.519 132.032  76.206  88.348
1915   0.000   0.000   0.000   0.000  52.853  45.639 171.553 158.862 165.180   0.000   0.000   0.000
      52.853  45.639 171.553 158.862 165.180
      25.353  21.893  82.294  76.206  79.237
1916   0.000   0.000   0.000   0.000  52.853 106.323 240.220 158.862 123.054   0.000   0.000   0.000
      52.853 106.323 240.220 158.862 123.054
      25.353  51.003 115.233  76.206  59.029
1917   0.000   0.000   0.000   0.000  53.046 203.161 242.616 157.047 134.073   0.000   0.000   0.000
      53.046 203.161 242.616 157.047 134.073
      25.446  97.456 116.383  75.336  64.315
1918   0.000   0.000   0.000   0.000  65.168 203.887 241.817 158.862 207.989   0.000   0.000   0.000
      65.168 203.887 241.817 158.862 207.989
      31.261  97.804 116.000  76.206  99.772
1919   0.000   0.000   0.000   0.000  52.853 136.408 241.817 158.862 161.948   0.000   0.000   0.000
      52.853 136.408 241.817 158.862 161.948
      25.353  65.435 116.000  76.206  77.687
1920   0.000   0.000   0.000   0.000  53.046 203.161 241.817 202.704 215.714   0.000   0.000   0.000
      53.046 203.161 241.817 202.704 215.714
      25.446  97.456 116.000  97.237 103.478
1921   0.000   0.000   0.000   0.000  52.853 203.887 274.440 157.955 145.530   0.000   0.000   0.000
      52.853 203.887 274.440 157.955 145.530
      25.353  97.804 131.649  75.771  69.811
9999
```

APPENDIX C14

DESCRIPTION OF DATA FILES

FILE 14
RESERVOIR EVAPORATION

C14 - RESERVOIR EVAPORATION FILE

File Name: Exxxxx.DAT

```
Number of Years of Data (integer)

Year* (integer) ------------------------------------> repeat for
Gross Evaporation** (real), mm                     > each year
                                                   >
                                                   >
Year* (integer)                                    >
Gross Precipitation** (real), mm ------------------>

9999
```

---

* Years must be in sequential order; there cannot be gaps.

**One value for each month.

```
file:  ERSRVR01.DAT


  10
1912   -3.   -3.    0.   26.   48.   93.  118.  124.  103.   72.    6.    0.
1912   11.    9.   13.   35.   80.   84.  147.   88.   20.   30.   24.    3.
1913   -1.    3.   20.   26.   48.   94.  119.  125.  103.   72.    4.   -1.
1913   19.   38.   32.    6.   27.   60.   24.   37.    9.   13.    1.    0.
1914   -2.   -0.   22.   27.   49.   96.  122.  128.  106.   74.    2.   -3.
1914   29.   19.   19.   70.  142.  188.   64.   28.   70.   37.   39.   38.
1915   -2.   -4.   24.   28.   51.   99.  125.  131.  109.   76.    3.   -3.
1915   24.    3.    0.   12.  104.  123.   85.   18.   61.   49.   13.    1.
1916   -2.   -2.   22.   26.   47.   92.  117.  122.  102.   71.    5.   -2.
1916   14.    5.   10.   15.   57.   67.  136.  101.   81.   18.    9.   12.
1917   -2.   -1.   23.   28.   51.  100.  126.  132.  110.   77.    6.   -2.
1917   21.    5.    7.   41.   35.   25.   10.   42.   41.   28.    1.   22.
1918   -2.    0.   27.   28.   51.  100.  126.  132.  110.   77.    3.   -3.
1918   23.   12.   24.   15.   11.   42.   22.   68.   28.    3.    1.   19.
1919   -2.   -1.    2.   28.   51.  100.  126.  132.  109.   77.   -1.   -3.
1919    6.   10.   13.   67.   53.   21.   28.   31.   50.   13.   39.    8.
1920   -2.    1.    6.   26.   46.   94.  118.  124.  103.   72.    1.   -2.
1920   28.   10.   30.   54.   36.   40.   30.    7.   35.   24.    3.    9.
1921   -2.    3.   20.   28.   52.  101.  127.  134.  111.   78.    1.   -1.
1921   12.   12.   51.   49.   27.   38.   56.   42.   28.    4.   21.    8.
9999
```

APPENDIX C15

DESCRIPTION OF DATA FILES

FILE 15
GAUGE BOUNDARY FLOWS

C15 - GAUGE BOUNDARY FLOWS FILE

File Name Bxxxxxx.DAT

Number of Years of Data (integer)

Percentage Required (real), %

Year* (integer) ------------------------------------> repeat for
Streamflow** (real), m^3/s ---------------------------> each year

9999

---

* Years must be in sequential order; there cannot be gaps.

**One value for each month.

file: BBNDRY07.DAT

```
  10
  50.0
1912   52.44   69.55   78.18  303.61  495.86  642.93  911.46  535.36  373.05  239.48  173.53   88.07
1913   47.43   64.34   72.66  382.73  435.12  987.41  659.70  470.03  293.14  216.77  150.82   90.90
1914   72.18   60.00  115.46  165.74  484.84  667.23  512.90  266.38  184.46  276.66  177.77   82.49
1915   75.75   65.10  146.09  263.77  667.03 1180.27 1482.47  760.53  377.86  284.39  156.59   92.11
1916   59.69  109.98  411.95  399.95  411.56 1606.19 1470.13  635.54  581.12  296.36  189.55  114.23
1917   78.92   77.28   83.45  370.21  795.68 1467.32  768.12  328.96  223.00  193.15  121.17   58.53
1918   76.17   81.30  163.10  272.66  361.21  758.04  393.86  294.16  193.35  161.55   92.57   65.92
1919   81.30   92.03   92.20  279.69  693.34  874.40  513.13  423.03  227.58  126.72   93.16   60.43
1920   53.52   64.85  109.76  393.38  925.59  744.99  891.05  343.31  149.71  146.82   90.42   66.74
1921   51.40   60.80   90.08  273.99  515.65  782.68  433.05  245.71  112.96   97.75   83.14   63.03
9999
```

APPENDIX C16

DESCRIPTION OF DATA FILES

FILE 16
GROWTH DISTRIBUTION FACTORS
DATA FILE

C16 - GROWTH DISTRIBUTION FACTORS DATA FILE

File Name: DFACTORS.DAT

Sector Number (integer) - ------------------------> repeat for each
Growth Factors[*] (real) --------------------------> industrial sector

---

[*] One factor for each node. Values must be from 0.2 to 2.0. Sum of the values must equal the number of nodes.

file: DFACTORS.DAT

```
 1   1.   1.   1.   1.   1.   1.   1.   1.
 2   1.   1.   1.   1.   1.   1.   1.   1.
 3   1.   1.   1.   1.   1.   1.   1.   1.
 4   1.   1.   1.   1.   1.   1.   1.   1.
 5   1.   1.   1.   1.   1.   1.   1.   1.
 6   1.   1.   1.   1.   1.   1.   1.   1.
 7   1.   1.   1.   1.   1.   1.   1.   1.
 8   1.   1.   1.   1.   1.   1.   1.   1.
 9   1.   1.   1.   1.   1.   1.   1.   1.
10   1.   1.   1.   1.   1.   1.   1.   1.
11   1.   1.   1.   1.   1.   1.   1.   1.
12   1.   1.   1.   1.   1.   1.   1.   1.
13   1.   1.   1.   1.   1.   1.   1.   1.
14   1.   1.   1.   1.   1.   1.   1.   1.
15   1.   1.   1.   1.   1.   1.   1.   1.
16   1.   1.   1.   1.   1.   1.   1.   1.
17   1.   1.   1.   1.   1.   1.   1.   1.
18   1.   1.   1.   1.   1.   1.   1.   1.
19   1.   1.   1.   1.   1.   1.   1.   1.
20   1.   1.   1.   1.   1.   1.   1.   1.
21   1.   1.   1.   1.   1.   1.   1.   1.
22   1.   1.   1.   1.   1.   1.   1.   1.
23   1.   1.   1.   1.   1.   1.   1.   1.
24   1.   1.   1.   1.   1.   1.   1.   1.
25   1.   1.   1.   1.   1.   1.   1.   1.
26   1.   1.   1.   1.   1.   1.   1.   1.
27   1.   1.   1.   1.   1.   1.   1.   1.
28   1.   1.   1.   1.   1.   1.   1.   1.
29   1.   1.   1.   1.   1.   1.   1.   1.
30   1.   1.   1.   1.   1.   1.   1.   1.
```

APPENDIX C17

DESCRIPTION OF DATA FILES

FILE 17
EFFICIENCY CHANGE FACTORS
DATA FILE

C17 - EFFICIENCY CHANGE FACTORS DATA FILE

File Name: EFACTORS.DAT

Number of Sets of Factors* (integer)

Years in which factors take effect**

```
Sector Number (integer) ---------------------------> repeat for each
Efficiency Factors*** (real) ----------------------> industrial sector
```

---

* Maximum of 5.

** One year for each set (increasing chronological order).

***One factor for each set. Values must be from 0.5 to 1.5.

file: EFACTORS.DAT

```
 3
    1990  1995  2000
 1   1.    1.    1.
 2   1.    1.    1.
 3   1.    1.    1.
 4   1.    1.    1.
 5   1.    1.    1.
 6   1.    1.    1.
 7   1.    1.    1.
 8   1.    1.    1.
 9   1.    1.    1.
10   1.    1.    1.
11   1.    1.    1.
12   1.    1.    1.
13   1.    1.    1.
14   1.    1.    1.
15   1.    1.    1.
16   1.    1.    1.
17   1.    1.    1.
18   1.    1.    1.
19   1.    1.    1.
20   1.    1.    1.
21   1.    1.    1.
22   1.    1.    1.
23   1.    1.    1.
24   1.    1.    1.
25   1.    1.    1.
26   1.    1.    1.
27   1.    1.    1.
28   1.    1.    1.
29   1.    1.    1.
30   1.    1.    1.
```

APPENDIX C18

DESCRIPTION OF DATA FILES

FILE 18
INDUSTRIAL DEMAND CURVES DATA FILE

C18 - INDUSTRIAL DEMAND CURVES DATA FILE

File Name: xxxxxxx.$$$

Sector Number (integer) ----------------------------------> repeat
> for
x-coordinate* (real), Mm^3/$M final demand------> repeat > each
> for > industrial
y-coordinate** (real), $/$Mm^3$ -----------------> 5 data > sector
> points***>

Sector Number (integer) ----------------------------------> repeat
> for each
> industrial
Equation Coefficient**** (real) -------------------------> sector

Sector Number (integer) ----------------------------------> repeat
> for each
> industrial
Elasticity Coefficient *****(real) ----------------------> sector

---

* x-coordinate represents QUANTITY, and these values must be input in increasing order.

** y-coordinate represents PRICE, and these values must be input in decreasing order.

*** Fewer than 5 points may be used, but there must always be 5 pairs of values (even if the remainder are zeros).

**** Used to calculate intake adjustment factor: IAF - PF^c.
PF - price factor chosen by user, c - coefficient

*****Used to calculate intake adjustment factor: IAF - I + c*(PF-1).
PF - price factor chosen by user, c - coefficient

file: BC.$$$

```
 1  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 2  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 3  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 4  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 5  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 6  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 7  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 8  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 9  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
10  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
11  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
12  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
13  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
14  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
15  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
16  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
17  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
18  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
19  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
20  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
21  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
22  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
23  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
24  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
25  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
26  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
27  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
28  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
29  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
30  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 1  0.0
 2  0.0
 3  0.0
 4  0.0
 5  0.0
 6  0.0
 7  0.0
 8  0.0
 9  0.0
10  0.0
11  0.0
12  0.0
13  0.0
14  0.0
15  0.0
16  0.0
17  0.0
18  0.0
19  0.0
20  0.0
21  0.0
22  0.0
23  0.0
24  0.0
25  0.0
26  0.0
27  0.0
28  0.0
29  0.0
30  0.0
 1  0.0
 2  0.0
 3  0.0
 4  0.0
 5  0.0
 6  -0.35108
 7  -0.35108
 8  -1.5401
 9  -1.5401
10  -1.5401
```

```
11  -0.7817
12  -0.7817
13  -0.38536
14  -0.25277
15  -0.011698
16  -0.011698
17  -0.23356
18   0.0
19  -1.2134
20   0.0
21  -0.25277
22  -1.7937
23  -0.29466
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
```

file: ALBERTA.$$$

```
  1  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  2  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  3  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  4  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  5  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  6  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  7  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  8  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  9  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 10  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 11  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 12  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 13  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 14  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 15  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 16  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 17  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 18  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 19  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 20  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 21  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 22  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 23  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 24  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 25  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 26  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 27  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 28  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 29  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 30  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  1  0.0
  2  0.0
  3  0.0
  4  0.0
  5  0.0
  6 -0.441
  7 -0.441
  8 -1.144
  9 -1.144
 10 -1.144
 11 -0.227
 12 -0.227
 13 -0.197
 14 -0.995
 15 -1.299
 16 -1.299
 17 -0.832
 18 -0.832
 19 -0.995
 20 -0.995
 21 -0.4549
 22 -0.317
 23 -0.436
 24 -0.436
 25  0.0
 26  0.0
 27  0.0
 28  0.0
 29  0.0
 30  0.0
  1  0.0
  2  0.0
  3  0.0
  4  0.0
  5  0.0
  6  0.0
  7  0.0
  8  0.0
  9  0.0
 10  0.0
```

```
11   0.0
12   0.0
13   0.0
14   0.0
15   0.0
16   0.0
17   0.0
18   0.0
19   0.0
20   0.0
21   0.0
22   0.0
23   0.0
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
```

file. SASK.533

```
 1   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
 2   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
 3   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
 4   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
 5   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
 6   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
 7   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
 8   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
 9   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
10   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
11   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
12   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
13   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
14   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
15   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
16   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
17   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
18   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
19   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
20   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
21   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
22   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
23   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
24   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
25   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
26   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
27   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
28   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
29   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
30   0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0    0.0,0.0
 1   0.0
 2   0.0
 3   0.0
 4   0.0
 5   0.0
 6  -0.645
 7  -0.645
 8  -0.645
 9   0.0
10   0.0
11   0.0
12   0.0
13   0.0
14  -0.846
15  -0.846
16  -0.846
17  -0.846
18  -0.846
19  -0.846
20  -0.846
21  -0.133
22  -0.496
23  -0.496
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
 1   0.0
 2   0.0
 3   0.0
 4   0.0
 5   0.0
 6   0.0
 7   0.0
 8   0.0
 9   0.0
10   0.0
```

```
11   0.0
12   0.0
13   0.0
14   0.0
15   0.0
16   0.0
17   0.0
18   0.0
19   0.0
20   0.0
21   0.0
22   0.0
23   0.0
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
```

```
file:  MANITOBA.SSS


 1  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 2  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 3  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 4  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 5  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 6  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 7  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 8  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 9  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
10  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
11  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
12  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
13  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
14  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
15  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
16  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
17  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
18  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
19  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
20  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
21  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
22  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
23  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
24  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
25  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
26  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
27  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
28  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
29  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
30  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 1   0.0
 2   0.0
 3   0.0
 4   0.0
 5   0.0
 6  -0.719
 7  -0.719
 8  -0.198
 9  -0.2
10  -0.2
11   0.0
12   0.0
13  -2.11
14  -2.11
15  -0.188
16  -0.188
17   0.288
18  -1.883
19  -1.891
20  -1.891
21  -0.552
22  -0.89
23  -0.89
24  -0.89
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
 1   0.0
 2   0.0
 3   0.0
 4   0.0
 5   0.0
 6   0.0
 7   0.0
 8   0.0
 9   0.0
10   0.0
```

```
11   0.0
12   0.0
13   0.0
14   0.0
15   0.0
16   0.0
17   0.0
18   0.0
19   0.0
20   0.0
21   0.0
22   0.0
23   0.0
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
```

file: ONTARIO.SSS

```
  1  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  2  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  3  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  4  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  5  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  6  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  7  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  8  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  9  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 10  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 11  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 12  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 13  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 14  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 15  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 16  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 17  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 18  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 19  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 20  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 21  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 22  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 23  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 24  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 25  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 26  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 27  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 28  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 29  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 30  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  1  0.0
  2  0.0
  3  0.0
  4  0.0
  5  0.0
  6 -0.633
  7 -0.633
  8 -1.099
  9 -0.953
 10 -0.953
 11 -1.136
 12 -1.136
 13 -0.615
 14 -0.794
 15 -0.188
 16 -0.188
 17 -0.818
 18  0.0
 19 -0.794
 20  0.0
 21 -0.669
 22 -1.175
 23 -0.917
 24  0.0
 25  0.0
 26  0.0
 27  0.0
 28  0.0
 29  0.0
 30  0.0
  1  0.0
  2  0.0
  3  0.0
  4  0.0
  5  0.0
  6  0.0
  7  0.0
  8  0.0
  9  0.0
 10  0.0
```

```
11   0.0
12   0.0
13   0.0
14   0.0
15   0.0
16   0.0
17   0.0
18   0.0
19   0.0
20   0.0
21   0.0
22   0.0
23   0.0
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
```

file: QUEBEC.SSS

```
 1   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 2   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 3   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 4   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 5   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 6   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 7   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 8   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 9   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
10   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
11   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
12   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
13   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
14   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
15   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
16   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
17   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
18   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
19   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
20   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
21   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
22   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
23   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
24   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
25   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
26   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
27   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
28   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
29   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
30   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 1   0.0
 2   0.0
 3   0.0
 4   0.0
 5   0.0
 6  -0.732
 7  -0.732
 8  -0.593
 9  -0.604
10  -0.604
11  -0.853
12  -0.853
13  -0.439
14  -1.121
15  -0.292
16  -0.292
17  -1.294
18   0.0
19  -1.121
20   0.0
21  -0.228
22  -0.409
23  -1.033
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
 1   0.0
 2   0.0
 3   0.0
 4   0.0
 5   0.0
 6   0.0
 7   0.0
 8   0.0
 9   0.0
10   0.0
```

```
11   0.0
12   0.0
13   0.0
14   0.0
15   0.0
16   0.0
17   0.0
18   0.0
19   0.0
20   0.0
21   0.0
22   0.0
23   0.0
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
```

file: NB.SSS

```
 1  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 2  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 3  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 4  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 5  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 6  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 7  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 8  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 9  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
10  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
11  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
12  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
13  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
14  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
15  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
16  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
17  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
18  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
19  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
20  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
21  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
22  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
23  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
24  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
25  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
26  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
27  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
28  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
29  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
30  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 1   0.0
 2   0.0
 3   0.0
 4   0.0
 5   0.0
 6  -0.222
 7  -0.222
 8  -0.222
 9  -0.222
10  -0.222
11  -0.519
12  -0.519
13  -0.519
14  -1.172
15  -1.172
16   1.172
17  -1.172
18  -1.172
19  -1.172
20  -1.172
21  -1.172
22  -1.172
23  -1.172
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
 1   0.0
 2   0.0
 3   0.0
 4   0.0
 5   0.0
 6   0.0
 7   0.0
 8   0.0
 9   0.0
10   0.0
```

```
11   0.0
12   0.0
13   0.0
14   0.0
15   0.0
16   0.0
17   0.0
18   0.0
19   0.0
20   0.0
21   0.0
22   0.0
23   0.0
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
```

file: PEI.SSS

```
  1  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
  2  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
  3  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
  4  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
  5  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
  6  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
  7  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
  8  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
  9  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 10  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 11  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 12  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 13  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 14  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 15  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 16  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 17  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 18  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 19  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 20  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 21  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 22  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 23  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 24  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 25  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 26  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 27  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 28  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 29  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
 30  0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0   0.0,0.0
  1  0.0
  2  0.0
  3  0.0
  4  0.0
  5  0.0
  6 -0.644
  7 -0.644
  8  0.0
  9  0.0
 10  0.0
 11  0.0
 12  0.0
 13  0.0
 14  0.0
 15  0.0
 16  0.0
 17  0.0
 18  0.0
 19  0.0
 20  0.0
 21  0.0
 22  0.0
 23  0.0
 24  0.0
 25  0.0
 26  0.0
 27  0.0
 28  0.0
 29  0.0
 30  0.0
  1  0.0
  2  0.0
  3  0.0
  4  0.0
  5  0.0
  6  0.0
  7  0.0
  8  0.0
  9  0.0
 10  0.0
```

```
11   0.0
12   0.0
13   0.0
14   0.0
15   0.0
16   0.0
17   0.0
18   0.0
19   0.0
20   0.0
21   0.0
22   0.0
23   0.0
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
```

file: NS.899

```
  1  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  2  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  3  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  4  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  5  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  6  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  7  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  8  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  9  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 10  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 11  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 12  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 13  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 14  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 15  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 16  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 17  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 18  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 19  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 20  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 21  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 22  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 23  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 24  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 25  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 26  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 27  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 28  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 29  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 30  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
  1   0.0
  2   0.0
  3   0.0
  4   0.0
  5   0.0
  6  -0.759
  7  -0.759
  8  -0.759
  9  -0.759
 10  -0.759
 11  -0.825
 12  -0.825
 13  -0.825
 14  -0.532
 15  -0.532
 16  -0.532
 17  -0.532
 18  -0.532
 19  -0.532
 20  -0.532
 21  -0.532
 22  -0.865
 23  -0.865
 24   0.0
 25   0.0
 26   0.0
 27   0.0
 28   0.0
 29   0.0
 30   0.0
  1   0.0
  2   0.0
  3   0.0
  4   0.0
  5   0.0
  6   0.0
  7   0.0
  8   0.0
  9   0.0
 10   0.0
```

```
11   0.0
12   0.0
13   0.0
14   0.0
15   0.0
16   0.0
17   0.0
18   0.0
19   0.0
20   0.0
21   0.0
22   0.0
23   0.0
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
```

file: NFLD.SSS

```
 1  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 2  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 3  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 4  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 5  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 6  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 7  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 8  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 9  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
10  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
11  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
12  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
13  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
14  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
15  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
16  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
17  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
18  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
19  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
20  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
21  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
22  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
23  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
24  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
25  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
26  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
27  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
28  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
29  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
30  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
 1   0.0
 2   0.0
 3   0.0
 4   0.0
 5   0.0
 6   0.78
 7   0.0
 8   0.0
 9   0.0
10   0.0
11  -1.05
12  -1.05
13  -1.05
14  -1.05
15  -1.05
16  -1.05
17  -1.05
18  -1.05
19  -1.05
20  -1.05
21  -1.05
22  -1.05
23  -1.05
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
 1   0.0
 2   0.0
 3   0.0
 4   0.0
 5   0.0
 6   0.0
 7   0.0
 8   0.0
 9   0.0
10   0.0
```

```
11   0.0
12   0.0
13   0.0
14   0.0
15   0.0
16   0.0
17   0.0
18   0.0
19   0.0
20   0.0
21   0.0
22   0.0
23   0.0
24   0.0
25   0.0
26   0.0
27   0.0
28   0.0
29   0.0
30   0.0
```

APPENDIX C19

DESCRIPTION OF DATA FILES

FILE 19
DOMESTIC DEMAND CURVES
DATA FILE

C19 - DOMESTIC DEMAND CURVES DATA FILE

File Name: PROVINCE.$$$

```
Province Number (integer) -----------------------------> repeat
                                                       > for
x-coordinate* (real), L/d/capita---------> repeat for > each
                                         > 5 data     > province
y-coordinate** (real), $/L/d/capita-------> points***  >
```

---

* x-coordinate represents QUANTITY, and these values must be input in increasing order.

** y-coordinate represents PRICE, and these values must be input in decreasing order.

***Fewer than 5 points may be used, but there must be 5 pairs of values (even if the remainder are zeros).

file: PROVINCE.$$$

```
1  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
2  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
3  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
4  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0  0.0,0.0
```

APPENDIX C20

DESCRIPTION OF DATA FILES

FILE 20
THERMAL POWER DATA BASE

C20 - THERMAL POWER DATA BASE FILE

File Name: TPOWERDB.DAT

descriptor (string)
Number of Hydrological Designations (integer)

Designation Number (integer) ------------------------> repeat
Letter Code (3-character string) > for each
Hydrological Designation (25-character string) -------> designation

descriptor (string)
Number of Plant Fuel Types (integer)

Fuel Type Number (integer) --------------------------> repeat
Letter Code (3-character string) > for each
Fuel Description (25-character string) --------------> fuel type

descriptor (string)
Number of Plant Cooling Types (integer)

Cooling Type Number (integer) -----------------------> repeat
Letter Code (4-character string) > for each
Cooling Description (25-character string) -----------> cooling type

descriptor (string)
Number of Plant Condenser Types (integer)

Condenser Type Number (integer) ---------------------> repeat
Letter Code (3-character string) > for each
Condenser Description (25-character string) ---------> condenser type

Thermal Intake Coefficient (real), $Mm^3/GW \cdot h$ --> repeat for each
> cooling type,
> fuel type, and
> condenser type *

Thermal Consumption Coeff. (real), $Mm^3/GW \cdot h$ --> repeat for each
> cooling type,
> fuel type, and
> condenser type *

---

*This data can be set up in a matrix form, with cooling type across the top, fuel type down the side, and one matrix for each condenser type. Note that characteristics other than fuel type, cooling type and condenser type could be used to define thermal plants, but would result in incorrect titles in some of the output tables.

file: TPOWERDB.DAT

```
'No. hydrologic designations' 3
                                1   'WET'   'Wet hydrologic year       '
                                2   'AVG'   'Average hydrologic year   '
                                3   'DRY'   'Dry hydrologic year       '
'Number of fuel types'          4
                                1   'COL'   'Coal                      '
                                2   'OIL'   'Oil                       '
                                3   'GAS'   'Gas                       '
                                4   'NUC'   'Nuclear                   '
'Number of cooling types'       5
                                1   'ONCE'  'Once-through              '
                                2   'POND'  'Pond                      '
                                3   'RESV'  'Reservoir                 '
                                4   'WTWR'  'Wet Tower                 '
                                5   'DTWR'  'Dry Tower                 '
'Number of condenser types'     3
                                1   'LOW'   'Low  temp rise ( 9 deg C)'
                                2   'MED'   'Med. temp rise (11 deg C)'
                                3   'HIG'   'High temp rise (15 deg C)'

  0.166645   0.003397   0.001411   0.004442   0.000000
  0.166645   0.003397   0.001411   0.004442   0.000000
  0.166645   0.003397   0.001411   0.004442   0.000000
  0.207278   0.004225   0.001755   0.005525   0.000000

  0.136346   0.003397   0.001411   0.004442   0.000000
  0.136346   0.003397   0.001411   0.004442   0.000000
  0.136346   0.003397   0.001411   0.004442   0.000000
  0.169591   0.004225   0.001755   0.005525   0.000000

  0.099987   0.003397   0.001411   0.004442   0.000000
  0.099987   0.003397   0.001411   0.004442   0.000000
  0.099987   0.003397   0.001411   0.004442   0.000000
  0.124367   0.004225   0.001755   0.005525   0.000000


  0.001411   0.001698   0.001411   0.002221   0.000000
  0.001411   0.001698   0.001411   0.002221   0.000000
  0.001411   0.001698   0.001411   0.002221   0.000000
  0.001755   0.002113   0.001755   0.002763   0.000000

  0.001411   0.001698   0.001411   0.002221   0.000000
  0.001411   0.001698   0.001411   0.002221   0.000000
  0.001411   0.001698   0.001411   0.002221   0.000000
  0.001755   0.002113   0.001755   0.002763   0.000000

  0.001411   0.001698   0.001411   0.002221   0.000000
  0.001411   0.001698   0.001411   0.002221   0.000000
  0.001411   0.001698   0.001411   0.002221   0.000000
  0.001755   0.002113   0.001755   0.002763   0.000000
```

APPENDIX C21

DESCRIPTION OF DATA FILES

FILE 21
HYDROLOGY SPECIFICATION FILE

C21 - HYDROLOGY SPECIFICATION FILE

File Name: HYDROLGY.DAT

descriptor (string)
Number of Years of Data (integer)

```
Year (integer) ----------------------------> repeat for
Type of Hydrology (3-character string)* -----> each year
```

---

[*] Note: this string must be the same as one of those defined in the preceding TPOWERDB.DAT file (including use of upper and lower case characters).

file: HYDROLGY.DAT

```
'No. years'    10
             1912    'WET'
             1913    'WET'
             1914    'AVG'
             1915    'WET'
             1916    'WET'
             1917    'WET'
             1918    'AVG'
             1919    'DRY'
             1920    'AVG'
             1921    'AVG'
```

APPENDIX C22

DESCRIPTION OF DATA FILES

FILE 22
THERMAL POWER PLANT DATA

C22 - THERMAL POWER PLANT DATA FILE

File Name: THERMAL.DAT

```
descriptor (string)
Number of Plants (integer)

Plant Number (integer) ----------------------------->
Plant Name (25-character string)                    >
Supply Node Number (integer)                        >
Return Node Number (integer)                        > repeat
Installed Capacity (real), MW                       >
                                                    > for
Water Intake Coefficient* (real), Mm³/GW·h          >
Cooling Type Index (4-character string)             > each
Fuel Type Index (3-character string)                >
Condenser Type Index (3-character string)           > thermal
Consumption Coefficient* (real), Mm³/GW·h           >
                                                    > plant
Monthly Off-Stream Storage** (real), %              >
                                                    >
Monthly Off-Stream Return**  (real), % ------------->
```

---

* If unknown, then enter '-99' and the coefficient will be calculated.

**One percentage for each month (which must be zero or sum to 100).

file: THERMAL.DAT

```
'Number of thermal plants'    1

1   'Thermal Plant No. 1'       3  5   732.
    0.002925  'POND'   'COL'   'LOW'   0.001462
    0.0  0.0  12.5  12.5  12.5  12.5  12.5  12.5  12.5  12.5   0.0   0.0
    0.0  0.0   0.0   0.0  15.0  20.0  25.0  25.0  15.0   0.0   0.0   0.0
```

APPENDIX C23

DESCRIPTION OF DATA FILES

FILE 23
HYDRO POWER STATION DATA

C23 - HYDRO POWER STATION DATA FILE

File Name: HYDRO.DAT

```
descriptor (string)
Number of Stations (integer)

Station Number (integer) ---------------------------->
Station Name (25-character string)                   >
Node Number* (integer)                               > repeat
Average Head (real), m                               > for each
Efficiency** (real)                                  > station
Flow Factor** (real)                                 >
Installed Capacity (real), MW ---------------------->
```

---

* The monthly outflows at this node will be used to calculate hydro energy generation at this plant.

**Express as a decimal fraction.

file: HYDRO.DAT

```
'Number of hydro stations'         1

1   'Hydro Station No. 1       '     8    52.0     0.82     1.00    186.0
```

APPENDIX C24

DESCRIPTION OF DATA FILES

FILE 24
ELECTRIC ENERGY SCENARIO FILE

C24 - ELECTRIC ENERGY SCENARIO DATA FILE

File Name: POWER.DAT

```
descriptor (string)
Number of Scenarios (integer)

descriptor (string) ------------------------------------------>
Development Year (integer)                                    >
                                                              >
descriptor (string)                                           >
Development Description (50-character string)                 >
                                                              >
descriptor (string)                                           >
Number of Thermal Plants on Line (integer)                    > repeat
                                                              >
descriptor (string)                                           > for
Number of Hydro Stations on Line (integer)                    >
                                                              > each
descriptor (string) ----------------------------->            >
Thermal Plant Number (integer)                   >            > scen-
                                                 > repeat     > ario
Monthly Energy (real), GW·h ----> repeat         > for each   >
                                > for each       > thermal    >
                                > hydrologic     > plant      >
                                > designation --->            >
                                                              >
descriptor (string) -----------------------------> repeat     >
Hydro Station Number (integer) ------------------> for each   >
                                                 > hydro      >
                                                 > station --->
```

```
file:  POWER.DAT


'Number of scenarios'          1

'Development year'          1987
'Development description'  '1987 - Test Case Scenario'
'Number of thermal plants'     1
'Number of hydro stations'     1

'Plant No.' 1
   319.5 310.5 153.0 324.0 315.0 297.0 315.0 225.0 229.5 328.5 301.5 351.0
   355.0 345.0 170.0 360.0 350.0 330.0 350.0 250.0 255.0 365.0 335.0 390.0
   390.5 379.5 187.0 396.0 385.0 363.0 385.0 275.0 280.5 401.5 368.5 429.0

'Station No.' 1
```

APPENDIX C25

DESCRIPTION OF DATA FILES

FILE 25
THERMAL PLANT WATER USE RUN FILE

C25 - THERMAL PLANT WATER USE RUN FILE

File Name: THERMAL.RUN

```
descriptor (string)
Forecast Year (integer)

descriptor (string)
Number of Simulation Years (integer)

descriptor (string)
First Year of Simulation (integer)

descriptor (string)
Number of Thermal Plants (integer)

Plant Number (integer) -------------------> repeat
Plant Name (25-character string)          > for each
Supply Node Number (integer)              > thermal
Return Node Number (integer) -------------> plant

Simulation Year (integer) ----------------> -------------->
Plant Number (integer)                    >                >
Monthly Energy* (real), GW·h
Required Monthly Intake** (real), Mm^3    > repeat         > repeat
                                          > for            > for
Monthly Stream Withdrawals** (real), Mm^3 > each           > each
                                          > thermal        > simula-
Monthly Consumption** (real), Mm^3        > plant          > tion
                                          >                > year
Monthly Return* (real), Mm^3 -------------> -------------->
```

---

* One value for each month.

**One value for each month. Note that required intake is the amount actually needed by the plant, while the stream withdrawal is how much it takes in a given month. The difference between the two goes to, or comes from, off-stream storage.

```
file:  THERMAL.RUN


    'Forecast year                 '    1999
    'Number of years in simulation'      10
    'First year of simulation      '    1912
    'Number of thermal plants      '       1

     1    'Thermal Plant No. 1       '       3      5

1912   1    319.50    310.50    153.00    324.00    315.00    297.00    315.00    225.00    229.50    328.50    301.50  351.00
              0.93      0.91      0.45      0.95      0.92      0.87      0.92      0.66      0.67      0.96      0.88    1.03
              0.00      0.00      1.27      1.27      1.27      1.27      1.27      1.27      1.27      1.27      0.00    0.00
              0.47      0.45      0.22      0.47      0.46      0.43      0.46      0.33      0.34      0.48      0.44    0.51
              0.00      0.00      0.00      0.00      0.76      1.02      1.27      1.27      0.76      0.00      0.00    0.00
1913   1    319.50    310.50    153.00    324.00    315.00    297.00    315.00    225.00    229.50    328.50    301.50  351.00
              0.93      0.91      0.45      0.95      0.92      0.87      0.92      0.66      0.67      0.96      0.88    1.03
              0.00      0.00      1.27      1.27      1.27      1.27      1.27      1.27      1.27      1.27      0.00    0.00
              0.47      0.45      0.22      0.47      0.46      0.43      0.46      0.33      0.34      0.48      0.44    0.51
              0.00      0.00      0.00      0.00      0.76      1.02      1.27      1.27      0.76      0.00      0.00    0.00
1914   1    355.00    345.00    170.00    360.00    350.00    330.00    350.00    250.00    255.00    365.00    335.00  390.00
              1.04      1.01      0.50      1.05      1.02      0.97      1.02      0.73      0.75      1.07      0.98    1.14
              0.00      0.00      1.41      1.41      1.41      1.41      1.41      1.41      1.41      1.41      0.00    0.00
              0.52      0.50      0.25      0.53      0.51      0.48      0.51      0.37      0.37      0.53      0.49    0.57
              0.00      0.00      0.00      0.00      0.85      1.13      1.41      1.41      0.85      0.00      0.00    0.00
1915   1    319.50    310.50    153.00    324.00    315.00    297.00    315.00    225.00    229.50    328.50    301.50  351.00
              0.93      0.91      0.45      0.95      0.92      0.87      0.92      0.66      0.67      0.96      0.88    1.03
              0.00      0.00      1.27      1.27      1.27      1.27      1.27      1.27      1.27      1.27      0.00    0.00
              0.47      0.45      0.22      0.47      0.46      0.43      0.46      0.33      0.34      0.48      0.44    0.51
              0.00      0.00      0.00      0.00      0.76      1.02      1.27      1.27      0.76      0.00      0.00    0.00
1916   1    319.50    310.50    153.00    324.00    315.00    297.00    315.00    225.00    229.50    328.50    301.50  351.00
              0.93      0.91      0.45      0.95      0.92      0.87      0.92      0.66      0.67      0.96      0.88    1.03
              0.00      0.00      1.27      1.27      1.27      1.27      1.27      1.27      1.27      1.27      0.00    0.00
              0.47      0.45      0.22      0.47      0.46      0.43      0.46      0.33      0.34      0.48      0.44    0.51
              0.00      0.00      0.00      0.00      0.76      1.02      1.27      1.27      0.76      0.00      0.00    0.00
1917   1    319.50    310.50    153.00    324.00    315.00    297.00    315.00    225.00    229.50    328.50    301.50  351.00
              0.93      0.91      0.45      0.95      0.92      0.87      0.92      0.66      0.67      0.96      0.88    1.03
              0.00      0.00      1.27      1.27      1.27      1.27      1.27      1.27      1.27      1.27      0.00    0.00
              0.47      0.45      0.22      0.47      0.46      0.43      0.46      0.33      0.34      0.48      0.44    0.51
              0.00      0.00      0.00      0.00      0.76      1.02      1.27      1.27      0.76      0.00      0.00    0.00
1918   1    355.00    345.00    170.00    360.00    350.00    330.00    350.00    250.00    255.00    365.00    335.00  390.00
              1.04      1.01      0.50      1.05      1.02      0.97      1.02      0.73      0.75      1.07      0.98    1.14
              0.00      0.00      1.41      1.41      1.41      1.41      1.41      1.41      1.41      1.41      0.00    0.00
              0.52      0.50      0.25      0.53      0.51      0.48      0.51      0.37      0.37      0.53      0.49    0.57
              0.00      0.00      0.00      0.00      0.85      1.13      1.41      1.41      0.85      0.00      0.00    0.00
1919   1    390.50    379.50    187.00    396.00    385.00    363.00    385.00    275.00    280.50    401.50    368.50  429.00
              1.14      1.11      0.55      1.16      1.13      1.06      1.13      0.80      0.82      1.17      1.08    1.25
              0.00      0.00      1.55      1.55      1.55      1.55      1.55      1.55      1.55      1.55      0.00    0.00
              0.57      0.55      0.27      0.58      0.56      0.53      0.56      0.40      0.41      0.59      0.54    0.63
              0.00      0.00      0.00      0.00      0.93      1.24      1.55      1.55      0.93      0.00      0.00    0.00
1920   1    355.00    345.00    170.00    360.00    350.00    330.00    350.00    250.00    255.00    365.00    335.00  390.00
              1.04      1.01      0.50      1.05      1.02      0.97      1.02      0.73      0.75      1.07      0.98    1.14
              0.00      0.00      1.41      1.41      1.41      1.41      1.41      1.41      1.41      1.41      0.00    0.00
              0.52      0.50      0.25      0.53      0.51      0.48      0.51      0.37      0.37      0.53      0.49    0.57
              0.00      0.00      0.00      0.00      0.85      1.13      1.41      1.41      0.85      0.00      0.00    0.00
1921   1    355.00    345.00    170.00    360.00    350.00    330.00    350.00    250.00    255.00    365.00    335.00  390.00
              1.04      1.01      0.50      1.05      1.02      0.97      1.02      0.73      0.75      1.07      0.98    1.14
              0.00      0.00      1.41      1.41      1.41      1.41      1.41      1.41      1.41      1.41      0.00    0.00
              0.52      0.50      0.25      0.53      0.51      0.48      0.51      0.37      0.37      0.53      0.49    0.57
              0.00      0.00      0.00      0.00      0.85      1.13      1.41      1.41      0.85      0.00      0.00    0.00
```

APPENDIX C26

DESCRIPTION OF DATA FILES

FILE 26
HYDRO STATION RUN FILE

C26 - HYDRO STATION RUN FILE

File Name: HYDRO.RUN

descriptor (string)
Forecast Year (integer)

descriptor (string)
Number of Hydro Stations (integer)

```
Station Number (integer) ----------------->
Station Name (25-character string)        >
Node Number (integer)                     > repeat for
Average Head (real), m                    > each hydro
Efficiency Factor* (real)                 > station
Flow Factor (real)                        >
Installed Capacity (real), MW ------------>
```

---

*Expressed as a decimal fraction.

file: HYDRO.RUN

```
'Forecast year          '   1999
'Number of hydro plants'      1

 1  'Hydro Station No. 1      '    8     52.00    0.8200    1.0000   186.000
```

APPENDIX C27

DESCRIPTION OF DATA FILES

FILE 27
SIMULATION OUTFLOW FILE

C27 - MODULE 8 SIMULATION OUTFLOW FILE

File Name: OUTFLOWS.DAT

Run Description* (string)

Simulation Forecast Year (integer)

Number of Years in Simulation (integer)
Number of Nodes in Network (integer)

```
Year (integer) --------------------------------------> repeat
                                                      > for
Node Number (integer) ----------------> repeat        > each
Total Outflow** (real), Mm^3            > for         > year
Irrigation Intake** (real), Mm^3        > each        >
Irrigation Consumption** (real), Mm^3   > node -------->
```

---

* Three lines of information.

**One value for each month of the year.

```
file:  OUTFLOWS.DAT

        'TEST RUN FOR USER MANUAL                                        '
        '                                                                '
        'with reservoir drawdowns & with consumption cutbacks            '
         1999
    10     8
1912
    1,   245.91,   317.13,   648.40,  2345.17,  5100.29,  4935.00, 13017.58,  6427.47,  5656.74,  3430.22,  1609.98,   816.08
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
    2,   580.78,   663.14,  1350.21,  4924.28, 10590.96, 10245.70, 27027.88, 13348.14, 11745.06,  7123.81,  3344.09,  1643.77
           0.00,     0.00,     0.00,     0.00,     0.20,     0.61,     0.78,     0.63,     0.59,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.13,     0.38,     0.49,     0.40,     0.37,     0.00,     0.00,     0.00
    3,   579.62,   661.99,  1349.53,  6960.32, 10584.30, 10238.56, 30440.80, 14383.07, 12855.32,  7342.33,  3685.12,  1755.00
           0.00,     0.00,     0.00,     0.00,     0.40,     1.23,     1.56,     1.28,     1.15,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.25,     0.77,     0.98,     0.81,     0.72,     0.00,     0.00,     0.00
    4,     0.00,     0.00,     0.00,   551.86,     3.45,    10.35,   935.67,   289.51,   313.12,    61.37,    93.07,    29.22
           0.00,     0.00,     0.00,     0.00,     0.20,     0.61,     0.78,     0.64,     0.57,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.13,     0.39,     0.49,     0.41,     0.36,     0.00,     0.00,     0.00
    5,     0.00,     0.00,     0.00,   578.00,     6.92,     2.39,   969.81,   300.92,   312.35,    64.26,    95.88,    32.12
           0.00,     0.00,     0.00,     0.00,     5.16,    15.81,    18.40,    13.01,    16.36,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     3.27,     9.96,    11.59,     8.20,    10.31,     0.00,     0.00,     0.00
    6,   579.63,   662.00,  1344.79, 10000.94, 10600.19, 10277.20, 35628.05, 16003.67, 14570.48,  7674.83,  4198.09,  1920.82
           0.00,     0.00,     0.00,     0.00,     5.96,    18.15,    21.13,    14.94,    18.79,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     3.76,    11.44,    13.31,     9.42,    11.84,     0.00,     0.00,     0.00
    7,  8681.79,  9293.71, 10692.41, 28919.95, 39299.25, 48001.16, 78988.67, 49475.64, 34925.46, 25550.47, 17401.74, 11595.20
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
    8,  8681.79,  9293.71, 10692.41, 28919.95, 39299.25, 48001.16, 78988.67, 49475.64, 34925.46, 25550.47, 17401.74, 11595.20
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
1913
    1,   536.03,   460.27,   527.86,  4801.87,  5289.44,  6173.49,  6761.14,  4232.86,  2227.32,  1576.44,  1078.97,   420.53
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
    2,  1117.32,   958.69,  1098.43, 10024.82, 10983.67, 12819.26, 14037.94,  8793.94,  4629.82,  3274.63,  2188.41,   875.92
           0.00,     0.00,     0.00,     0.00,     0.20,     0.32,     0.78,     0.50,     0.57,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.13,     0.20,     0.49,     0.31,     0.36,     0.00,     0.00,     0.00
    3,  1116.15,   957.54,  1113.81, 12465.21, 10977.00, 12859.15, 15142.08,  9204.99,  5097.31,  3621.71,  2443.90,   912.16
           0.00,     0.00,     0.00,     0.00,     0.40,     0.63,     1.56,     1.00,     1.09,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.25,     0.40,     0.98,     0.63,     0.68,     0.00,     0.00,     0.00
    4,     0.00,     0.00,     5.12,   660.73,     3.45,    18.55,   311.61,   120.72,   137.94,    96.19,    69.74,    10.47
           0.00,     0.00,     0.00,     0.00,     0.20,     0.32,     0.78,     0.50,     0.54,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.13,     0.20,     0.49,     0.31,     0.34,     0.00,     0.00,     0.00
    5,     0.00,     0.00,     5.34,   692.04,     6.92,    20.08,   316.28,   124.15,   133.03,    99.08,    72.55,    10.69
           0.00,     0.00,     0.00,     0.00,     5.19,     8.29,    18.40,    13.01,    13.00,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     3.27,     5.23,    11.59,     8.20,     8.19,     0.00,     0.00,     0.00
    6,  1116.17,   957.55,  1130.24, 16109.77, 10996.83, 12965.43, 16884.91,  9893.76,  5868.58,  4144.37,  2824.68,   970.83
           0.00,     0.00,     0.00,     0.00,     5.96,     9.52,    21.13,    14.94,    14.93,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     3.76,     6.00,    13.31,     9.42,     9.41,     0.00,     0.00,     0.00
    7,  8479.09,  9025.58, 10001.10, 34442.98, 35364.91, 78011.67, 55177.99, 43022.89, 27446.98, 22630.69, 15551.40, 11882.63
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
    8,  8479.09,  9025.58, 10001.10, 34442.98, 35364.91, 78011.67, 55177.99, 43022.89, 27446.98, 22630.69, 15551.40, 11882.63
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
1914
    1,   356.78,   346.28,   490.09,  1125.69,  2413.10,  4581.83,  3030.84,  1685.47,  1367.86,  1855.42,  1027.89,   421.23
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
    2,   745.21,   721.32,  1017.81,  2338.82,  5061.89,  9511.59,  6295.39,  3503.87,  2845.06,  3853.58,  2080.31,   879.31
           0.00,     0.00,     0.00,     0.00,     0.36,     0.48,     0.79,     0.50,     0.55,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.23,     0.30,     0.50,     0.31,     0.35,     0.00,     0.00,     0.00
    3,   743.94,   720.08,  1145.64,  2848.07,  5237.05,  9504.61,  6577.15,  3786.29,  3203.59,  4350.54,  2405.69,   915.43
           0.00,     0.00,     0.00,     0.00,     0.72,     0.82,     1.58,     1.00,     1.10,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.46,     0.51,     0.99,     0.63,     0.69,     0.00,     0.00,     0.00
    4,     0.00,     0.00,    34.58,   139.74,    51.65,     6.79,    90.57,    86.04,   107.67,   136.37,    87.89,    10.47
           0.00,     0.00,     0.00,     0.00,     0.36,     0.41,     0.79,     0.50,     0.55,     0.00,     0.00,     0.00
           0.00,     0.00,     0.00,     0.00,     0.23,     0.26,     0.50,     0.31,     0.35,     0.00,     0.00,     0.00
    5,     0.00,     0.00,    37.48,   145.13,    57.80,     5.86,    82.81,    89.47,   102.15,   141.93,    93.29,    10.69
           0.00,     0.00,     0.00,     0.00,     5.35,    10.47,    23.58,    13.01,    12.79,     0.00,     0.00,     0.00
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          0.00,    0.00,     0.00,     0.00,     3.37,     6.60,    14.86,     8.20,     8.06,     0.00,     0.00,      0.00
     6,  743.95,  720.09,  1333.48,  3610.32,  5548.94,  9559.47,  7090.61,  4265.10,  3806.02,  5098.20,  2892.74,    968.75
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          0.00,    0.00,     0.00,     0.00,     3.87,     7.58,    17.06,     9.42,     9.25,     0.00,     0.00,      0.00
     7, 10581.72, 8621.20, 13830.90, 15587.95, 38568.25, 50173.52, 41392.88, 25073.59, 17541.03, 27671.75, 17794.14, 10927.04
          0.00,    0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
          0.00,    0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
     8, 10581.72, 8621.20, 13830.90, 15587.95, 38568.25, 50173.52, 41392.88, 25073.59, 17541.03, 27671.75, 17794.14, 10927.04
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          0.00,    0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
1915
     1,   358.69,  314.62,   778.99,  1510.10,  5748.86, 15365.84, 21605.89, 10470.37,  4934.25,  3784.06,  1490.59,    719.68
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          0.00,    0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
     2,   745.12,  655.79,  1622.75,  3192.38, 11938.62, 31902.68, 44856.85, 21740.85, 10247.72,  7857.98,  3097.70,   1442.91
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          0.00,    0.00,     0.00,     0.00,     0.10,     0.20,     0.31,     0.31,     0.21,     0.00,     0.00,      0.00
     3,   743.96,  654.65,  1758.87,  4938.12, 12510.53, 31896.06, 53519.91, 23515.22, 11345.28,  8381.84,  3379.11,   1538.07
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          0.00,    0.00,     0.00,     0.00,     0.21,     0.25,     0.51,     0.62,     0.46,     0.00,     0.00,      0.00
     4,     0.00,    0.00,    37.26,   474.10,   158.35,     3.24,  2353.05,   490.34,   303.36,   144.40,    74.93,     26.54
          0.00,    0.00,     0.00,     0.00,     0.17,     0.20,     0.41,     0.49,     0.37,     0.00,     0.00,      0.00
          0.00,    0.00,     0.00,     0.00,     0.10,     0.12,     0.25,     0.31,     0.23,     0.00,     0.00,      0.00
     5,     0.00,    0.00,    37.48,   495.05,   170.83,    10.01,  2460.57,   510.14,   313.19,   149.97,    80.33,     26.76
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          0.00,    0.00,     0.00,     0.00,     2.75,     2.34,     4.66,     7.90,     4.29,     0.00,     0.00,      0.00
     6,   743.97,  654.66,  1957.23,  7545.87, 13392.23, 31913.47, 66519.66, 26222.83, 13049.65,  9169.67,  3798.77,   1682.46
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          0.00,    0.00,     0.00,     0.00,     3.15,     2.69,     5.36,     9.07,     4.93,     0.00,     0.00,      0.00
     7, 10862.97, 8913.81, 16466.12, 24813.78, 57682.25, 96208.03,133420.73, 70885.16, 34262.57, 29096.96, 15929.33, 11884.48
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          0.00,    0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
     8, 10862.97, 8913.81, 16466.12, 24813.78, 57682.25, 96208.03,133420.73, 70885.16, 34262.57, 29096.96, 15929.33, 11884.48
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          0.00,    0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
1916
     1,   535.96,  435.58,  1068.47,  2593.65,  4623.11, 14465.47, 10810.39,  9676.66,  9009.39,  4399.59,  2286.22,   1137.70
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          0.00,    0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
     2,  1114.57,  907.39,  2220.25,  5442.33,  9599.55, 30032.85, 22445.06, 20092.73, 18708.44,  9135.08,  4748.69,   2308.23
          0.00,    0.00,     0.00,     0.00,     0.17,     0.40,     0.59,     0.49,     0.46,     0.00,     0.00,      0.00
          0.00,    0.00,     0.00,     0.00,     0.10,     0.25,     0.37,     0.31,     0.29,     0.00,     0.00,      0.00
     3,  1113.40,  906.24,  4970.28,  8722.52,  9592.93, 30326.65, 25975.94, 21098.59, 21197.76,  9696.43,  5115.64,   2534.63
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          0.00,    0.00,     0.00,     0.00,     0.21,     0.51,     0.88,     0.42,     0.61,     0.00,     0.00,      0.00
     4,     0.00,    0.00,   744.35,   888.82,     3.00,    86.11,   965.45,   279.08,   681.86,   152.44,    98.25,     61.36
          0.00,    0.00,     0.00,     0.00,     0.17,     0.40,     0.70,     0.33,     0.49,     0.00,     0.00,      0.00
          0.00,    0.00,     0.00,     0.00,     0.10,     0.25,     0.44,     0.21,     0.31,     0.00,     0.00,      0.00
     5,     0.00,    0.00,   776.71,   927.92,     7.44,    92.55,  1005.35,   297.98,   702.71,   160.68,   103.66,     64.26
          0.00,    0.00,     0.00,     0.00,     4.36,     8.47,    13.01,     4.94,    13.88,     0.00,     0.00,      0.00
          0.00,    0.00,     0.00,     0.00,     2.75,     5.34,     8.20,     3.11,     8.75,     0.00,     0.00,      0.00
     6,  1113.42,  906.25,  9068.59, 13624.20,  9609.50, 30806.35, 31333.42, 22670.46, 24957.24, 10540.51,  5664.89,   2874.54
          0.00,    0.00,     0.00,     0.00,     5.00,     9.73,    14.93,     5.67,    15.94,     0.00,     0.00,      0.00
          0.00,    0.00,     0.00,     0.00,     3.15,     6.13,     9.41,     3.57,    10.05,     0.00,     0.00,      0.00

     7,   9295.93, 11724.92, 41911.14, 36923.69, 33508.87,134499.31,130292.27, 57047.72, 52155.10, 33598.85, 19332.51, 14225.60
          0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
          0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
     8,   9295.93, 11724.92, 41911.14, 36923.69, 33508.87,134499.31,130292.27, 57047.72, 52155.10, 33598.85, 19332.51, 14225.60
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          0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
1917
     1,   787.86,   554.10,   645.21,  5165.33, 11690.91, 11120.83,  4754.61,  2673.99,  2300.37,  1884.65,  1316.64,    572.75
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          0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,      0.00
     2,  1636.98,  1154.13,  1341.66, 10779.68, 24274.01, 23090.51,  9872.54,  5553.04,  4780.63,  3914.96,  2737.12,   1135.28
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          0.00,     0.00,     0.00,     0.00,     0.10,     0.26,     0.57,     0.31,     0.37,     0.00,     0.00,      0.00
     3,  1721.52,  1152.98,  1410.62, 13512.96, 25475.34, 23461.97, 10668.50,  5931.96,  5245.47,  3908.49,  2808.58,   1166.16
          0.00,     0.00,     0.00,     0.00,     0.33,     0.95,     1.82,     0.98,     1.16,     0.00,     0.00,      0.00
          0.00,     0.00,     0.00,     0.00,     0.21,     0.60,     1.15,     0.62,     0.73,     0.00,     0.00,      0.00
     4,    23.86,     0.00,    18.51,   741.08,   329.77,   107.95,   229.77,   112.83,   136.40,     0.00,    20.49,      7.79
          0.00,     0.00,     0.00,     0.00,     0.17,     0.48,     0.91,     0.49,     0.58,     0.00,     0.00,      0.00
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         0.00,     0.00,     0.00,     0.00,     0.10,     0.30,     0.57,     0.31,     0.37,     0.00,     0.00,     0.00
  5,    24.08,     0.00,    18.73,   774.99,   347.60,   111.90,   227.30,   116.11,   129.80,     0.00,    20.71,     8.01
         0.00,     0.00,     0.00,     0.00,     4.36,    10.66,    23.58,    13.01,    14.02,     0.00,     0.00,     0.00
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  6,  1847.16,  1152.99,  1510.08, 17598.16, 27294.54, 24088.95, 11934.14,  6554.66,  5987.64,  3903.76,  2919.79,  1214.12
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         0.00,     0.00,     0.00,     0.00,     3.15,     7.72,    17.06,     9.42,    10.15,     0.00,     0.00,     0.00
  7, 11143.89,  9929.85, 11313.02, 35394.83, 66259.91,122178.01, 64620.95, 30542.41, 21837.72, 22039.21, 13521.07,  9035.05
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         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
  8, 11143.89,  9929.85, 11313.02, 35394.83, 66259.91,122178.01, 64620.95, 30542.41, 21837.72, 22039.21, 13521.07,  9035.05
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         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
1918
  1,   587.01,   447.76,  1768.58,  3550.79,  2447.29,  4475.27,  2389.81,  2280.77,  1662.49,  1304.75,   647.96,   353.94
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         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
  2,  1219.18,   934.09,  3728.56,  7374.06,  5082.79,  9296.04,  4965.94,  4739.23,  3455.88,  2657.42,  1347.87,   737.02
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         0.00,     0.00,     0.00,     0.00,     0.13,     0.43,     0.57,     0.39,     0.36,     0.00,     0.00,     0.00
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         0.00,     0.00,     0.00,     0.00,     0.26,     0.86,     1.15,     0.79,     0.71,     0.00,     0.00,     0.00
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         0.00,     0.00,     0.00,     0.00,     0.13,     0.43,     0.57,     0.39,     0.35,     0.00,     0.00,     0.00
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         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
  8, 10370.02,  9808.63, 20096.57, 25490.97, 28891.13, 53600.44, 31704.31, 28689.66, 17654.55, 16865.49, 10755.37,  9849.99
         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
1919
  1,   442.08,   314.69,   316.25,  1897.28,  2665.05,  2279.44,  1773.90,  2566.65,  1440.02,   900.50,   456.90,   270.71
         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
  2,   918.90,   555.86,   661.83,  3994.28,  5533.56,  4733.72,  3685.79,  5330.53,  2992.40,  1821.95,   949.45,   565.41
         0.00,     0.00,     0.00,     0.00,     0.20,     0.68,     0.90,     0.49,     0.49,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     0.13,     0.43,     0.57,     0.31,     0.31,     0.00,     0.00,     0.00
  3,   917.53,   554.52,   709.26,  6149.34,  6477.51,  4726.30,  3678.03,  5519.13,  3363.91,  1815.27,   961.09,   636.24
         0.00,     0.00,     0.00,     0.00,     0.41,     1.36,     1.80,     1.00,     0.96,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     0.26,     0.86,     1.14,     0.63,     0.60,     0.00,     0.00,     0.00
  4,     0.00,     0.00,    13.15,   585.56,   260.67,    10.42,    12.69,    61.94,   109.19,     0.00,     2.35,    18.51
         0.00,     0.00,     0.00,     0.00,     0.20,     0.68,     0.90,     0.50,     0.48,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     0.13,     0.43,     0.57,     0.31,     0.30,     0.00,     0.00,     0.00
  5,     0.00,     0.00,    13.37,   611.69,   272.25,     2.49,     1.78,    62.82,   105.82,     0.00,     2.57,    21.41
         0.00,     0.00,     0.00,     0.00,     9.44,    16.00,    20.62,    13.01,    11.20,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     5.95,    10.08,    12.99,     8.20,     7.06,     0.00,     0.00,     0.00
  6,   917.54,   654.53,   779.25,  9368.81,  7910.15,  4764.97,  3750.32,  5861.48,  3975.59,  1810.54,   981.58,   745.80
         0.00,     0.00,     0.00,     0.00,    10.84,    18.37,    23.68,    14.94,    12.86,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     6.83,    11.58,    14.92,     9.42,     8.11,     0.00,     0.00,     0.00
  7,  9225.94,  8623.37,  9063.54, 20053.04, 33432.62, 38600.94, 22215.21, 32243.72, 17202.56, 11768.83,  8542.44,  9241.69
         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
  8,  9225.94,  8623.37,  9063.54, 20053.04, 33432.62, 38600.94, 22215.21, 32243.72, 17202.56, 11768.83,  8542.44,  9241.69
         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
1920
  1,   284.44,   259.01,   372.72,  3812.58, 11824.94,  4314.64,  5703.30,  2127.08,  1069.94,   722.32,   370.69,   254.64
         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00,     0.00
  2,   592.53,   542.13,   777.23,  7970.22, 24552.67,  8961.80, 11841.78,  4422.15,  2168.65,  1504.49,   769.93,   530.59
         0.00,     0.00,     0.00,     0.00,     0.17,     0.61,     0.79,     0.64,     0.61,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     0.11,     0.38,     0.50,     0.41,     0.38,     0.00,     0.00,     0.00
  3,   674.28,   693.29,   897.02, 12504.84, 29953.63,  9771.05, 12937.88,  4739.20,  2534.88,  1690.75,   885.35,   553.32
         0.00,     0.00,     0.00,     0.00,     0.34,     1.21,     1.41,     1.28,     1.23,     0.00,     0.00,     0.00
         0.00,     0.00,     0.00,     0.00,     0.21,     0.76,     0.89,     0.81,     0.77,     0.00,     0.00,     0.00
```

```
    4,     21.19,     40.88,     31.90,   1228.38,   1465.45,    228.13,    306.97,     99.54,    111.07,     50.68,     30.86,      5.12
            0.00,      0.00,      0.00,      0.00,      0.17,      0.61,      0.70,      0.64,      0.61,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      0.11,      0.38,      0.44,      0.41,      0.39,      0.00,      0.00,      0.00
    5,     24.08,     43.52,     34.80,   1283.02,   1536.85,    236.43,    312.47,     95.13,    102.26,     53.55,     33.67,      8.01
            0.00,      0.00,      0.00,      0.00,      4.43,     10.66,     20.41,     16.78,     16.72,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      2.79,      6.72,     12.86,     10.58,     10.54,      0.00,      0.00,      0.00
    6,    797.24,    918.02,   1071.48,  19275.35,  38043.00,  11052.28,  14659.19,   5286.66,   3156.33,   1972.36,   1061.36,    590.57
            0.00,      0.00,      0.00,      0.00,      5.09,     12.25,     23.43,     19.27,     19.20,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      3.21,      7.72,     14.77,     12.14,     12.10,      0.00,      0.00,      0.00
    7,   8636.92,   8393.35,  13413.54,  37714.84,  76649.45,  56725.91,  76412.38,  31773.36,  14206.03,  16055.39,  10501.42,   9849.80
            0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00
    8,   8636.92,   8393.35,  13413.54,  37714.84,  76649.45,  56725.91,  76412.38,  31773.36,  14206.03,  16055.39,  10501.42,   9849.80
            0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00
1921
    1,    262.73,    203.37,    230.89,   2970.05,   3401.09,   3293.18,   2342.24,   1688.30,    916.69,    713.82,    381.38,    217.07
            0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00
    2,    546.71,    423.59,    480.05,   6223.09,   7082.44,   6838.73,   4867.61,   3509.39,   1854.81,   1487.96,    796.17,    455.52
            0.00,      0.00,      0.00,      0.00,      0.17,      0.61,      0.70,      0.49,      0.41,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      0.11,      0.39,      0.44,      0.31,      0.26,      0.00,      0.00,      0.00
    3,    545.44,    436.85,    665.55,   8658.19,   7055.71,   6831.50,   4860.22,   3502.55,   1928.42,   1481.38,    807.91,    454.15
            0.00,      0.00,      0.00,      0.00,      0.34,      1.23,      1.39,      0.98,      0.80,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      0.21,      0.77,      0.88,      0.62,      0.50,      0.00,      0.00,      0.00
    4,      0.00,      4.59,     56.01,    660.73,      3.04,     10.35,      9.13,      8.09,     27.47,      0.00,      2.35,      0.00
            0.00,      0.00,      0.00,      0.00,      0.17,      0.61,      0.70,      0.49,      0.40,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      0.11,      0.39,      0.44,      0.31,      0.25,      0.00,      0.00,      0.00
    5,      0.00,      4.82,     58.90,    689.45,      7.53,      2.38,      5.18,      6.74,     24.03,      0.00,      2.57,      0.00
            0.00,      0.00,      0.00,      0.00,      4.36,     16.00,     15.02,     12.53,      9.25,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      2.75,     10.08,      9.46,      7.90,      5.83,      0.00,      0.00,      0.00
    6,    545.45,    460.79,    988.57,  12300.15,   7072.41,   6892.64,   4947.35,   3552.88,   2095.13,   1476.65,    828.40,    454.16
            0.00,      0.00,      0.00,      0.00,      5.00,     18.37,     17.24,     14.39,     10.63,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      3.15,     11.58,     10.87,      9.07,      6.70,      0.00,      0.00,      0.00
    7,   8671.72,   8098.21,  11265.59,  25172.03,  41294.33,  61226.14,  34642.77,  22802.54,  11177.50,  11327.81,   9682.67,   9432.16
            0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00
    8,   8671.72,   8098.21,  11265.59,  25172.03,  41294.33,  61226.14,  34642.77,  22802.54,  11177.50,  11327.81,   9682.67,   9432.16
            0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00
            0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00,      0.00
```

APPENDIX C28

DESCRIPTION OF DATA FILES

FILE 28
PLOTTER SUMMARY FILE

C28 - PLOTTER SUMMARY FILE

File Name: PLOTTER.SUM

```
Run Description, Line 1 (string)

Run Description, Line 2 (string)

Run Description, Line 2 (string)

Forecast Year (integer)

descriptor (string) -------------------------------------------->
Node Number (integer)                                            >
                                                                 >
descriptor (string)                                              >
Seasonal Intake* (real), Mm^3                                    >
                                                                 >
descriptor (string)                                              >
Annual Intake* (real), Mm^3                                      >
                                                                 >
descriptor (string)                                              >
Seasonal Consumption* (real), Mm^3                               >
                                                                 >
descriptor (string)                                              >
Annual Consumption* (real), Mm^3                                 >
                                                                 >
descriptor (string) --------------------------------> repeat for >
Monthly Intake Occurrence Summary** (real), % -------> each month >
                                                                 >
descriptor (string)                                              >
Total Intake Occurrence Summary** (real), %                      >
                                                                 >
descriptor (string)                                              >
Seasonal Intake Occurrence Summary** (real), %                   >
                                                                 >
descriptor (string)                                              >
Annual Intake Occurrence Summary** (real), %                     >
                                                                 >
descriptor (string) --------------------------------> repeat for >
Monthly Consumption Occurrence Summary** (real), % --> each month >
                                                                 >
descriptor (string)                                              >
Total Consumption Occurrence Summary** (real), %                 >
                                                                 >
descriptor (string)                                              > repeat for
Seasonal Consumption Occurrence Summary** (real), %              > each node
```

---

* One value for each of 7 usage categories.

**One value for each of 4 occurrence ranges.

```
descriptor (string)                                                >
Annual Consumption Occurrence Summary* (real), %                   >
                                                                   >
descriptor (string) ---------------------------------> repeat for  >
Monthly Minimum Flow Occurrence Summary* (real), % --> each month  >
                                                                   >
descriptor (string)                                                >
Total Minimum Flow Occurrence Summary*  (real), %                  >
                                                                   >
descriptor (string)                                                >
Seasonal Minimum Flow Occurrence Summary* (real), %                >
                                                                   >
descriptor (string)                                                >
Annual Minimum Flow Occurrence Summary* (real), %                  >
                                                                   >
descriptor (string)                                                >
Average Total Supply** (real), Mm^3                                >
                                                                   >
descriptor (string)                                                >
Average Total Intake** (real), Mm^3                                >
                                                                   >
descriptor (string)                                                >
Average Total Consumption** (real), Mm^3                           >
                                                                   >
descriptor (string)                                                >
Average Total Outflow** (real), Mm^3                               >
                                                                   >
descriptor (string)                                                >
Average Minimum Flow** (real), Mm^3                                > repeat for
                                                                   > each node
descriptor (string)                                                >
Reservoir Number*** (integer),                                     >
                                                                   >
descriptor (string) ---------------------------------> repeat for  >
Monthly Elevation Occurrence Summary** (real), % ----> each month  >
                                                                   >
descriptor (string) ---------------------------------> repeat for  >
Monthly Outflow Occurrence Summary****(real), % -----> each month  >
```

---

* One value for each of 4 occurrence ranges.

** One value for each month.

*** If number is zero, then skip remainder of data for this node.

****One value for each of 6 occurrence ranges.

```
file:   PLOTTER.SUM

         'TEST RUN FOR USER MANUAL                                          '
         '                                                                  '
         'with reservoir drawdowns & with consumption cutbacks              '
          1999
'Node' 1
         'Intake  Season '    0.0     0.0     0.0     0.0     0.0     0.0     0.0
         '        Annual '    0.0     0.0     0.0     0.0     0.0     0.0     0.0
         'Consume Season '    0.0     0.0     0.0     0.0     0.0     0.0     0.0
         '        Annual '    0.0     0.0     0.0     0.0     0.0     0.0     0.0
         'Intake     Jan '  100.0     0.0     0.0     0.0
         '           Feb '  100.0     0.0     0.0     0.0
         '           Mar '  100.0     0.0     0.0     0.0
         '           Apr '  100.0     0.0     0.0     0.0
         '           May '  100.0     0.0     0.0     0.0
         '           Jun '  100.0     0.0     0.0     0.0
         '           Jul '  100.0     0.0     0.0     0.0
         '           Aug '  100.0     0.0     0.0     0.0
         '           Sep '  100.0     0.0     0.0     0.0
         '           Oct '  100.0     0.0     0.0     0.0
         '           Nov '  100.0     0.0     0.0     0.0
         '           Dec '  100.0     0.0     0.0     0.0
         '         Total '  100.0     0.0     0.0     0.0
         '         Season'  100.0     0.0     0.0     0.0
         '         Annual'  100.0     0.0     0.0     0.0
         'Consume    Jan '  100.0     0.0     0.0     0.0
         '           Feb '  100.0     0.0     0.0     0.0
         '           Mar '  100.0     0.0     0.0     0.0
         '           Apr '  100.0     0.0     0.0     0.0
         '           May '  100.0     0.0     0.0     0.0
         '           Jun '  100.0     0.0     0.0     0.0
         '           Jul '  100.0     0.0     0.0     0.0
         '           Aug '  100.0     0.0     0.0     0.0
         '           Sep '  100.0     0.0     0.0     0.0
         '           Oct '  100.0     0.0     0.0     0.0
         '           Nov '  100.0     0.0     0.0     0.0
         '           Dec '  100.0     0.0     0.0     0.0
         '         Total '  100.0     0.0     0.0     0.0
         '         Season'  100.0     0.0     0.0     0.0
         '         Annual'  100.0     0.0     0.0     0.0
         'Min.Flow   Jan '    0.0     0.0     0.0     0.0
         '           Feb '    0.0     0.0     0.0     0.0
         '           Mar '    0.0     0.0     0.0     0.0
         '           Apr '    0.0     0.0     0.0     0.0
         '           May '    0.0     0.0     0.0     0.0
         '           Jun '    0.0     0.0     0.0     0.0
         '           Jul '    0.0     0.0     0.0     0.0
         '           Aug '    0.0     0.0     0.0     0.0
         '           Sep '    0.0     0.0     0.0     0.0
         '           Oct '    0.0     0.0     0.0     0.0
         '           Nov '    0.0     0.0     0.0     0.0
         '           Dec '    0.0     0.0     0.0     0.0
         '         Total '    0.0     0.0     0.0     0.0
         '         Season'    0.0     0.0     0.0     0.0
         '         Annual'    0.0     0.0     0.0     0.0
         'Average Supply '  445.7   365.1   689.7  3017.1  5525.3  7101.0  7220.2  4384.5  3049.7  2048.2  1056.5  498.2
         '         Intake '   0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0    0.0
         '        Consume'    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0    0.0
         '        Outflow'  439.5   365.3   684.7  2977.3  5520.4  7100.5  7219.0  4383.0  3058.5  2057.2  1066.7  518.4
         'Minimum Flow   '    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0    0.0
 'Rsvr' 1
         'Elevation  Jan '    0       0       0       0     100       0
         '           Feb '    0       0       0       0     100       0
         '           Mar '    0       0       0       0      90      10
         '           Apr '    0       0       0       0      10      90
         '           May '    0       0       0       0       0     100
         '           Jun '    0       0       0       0       0     100
         '           Jul '    0       0       0       0       0     100
         '           Aug '    0       0       0       0       0     100
         '           Sep '    0       0       0       0      20      80
         '           Oct '    0       0       0       0      40      60
```

```
          '         Nov '    0       0        0        0      60      40
          '         Dec '    0       0        0        0     100       0
          'Outflow  Jan '    0       0        0       90      10       0
          '         Feb '    0       0        0      100       0       0
          '         Mar '    0       0        0       70      20      10
          '         Apr '    0       0        0        0      10      90
          '         May '    0       0        0        0       0     100
          '         Jun '    0       0        0        0       0     100
          '         Jul '    0       0        0        0       0     100
          '         Aug '    0       0        0        0       0     100
          '         Sep '    0       0        0        0      20      80
          '         Oct '    0       0        0        0      40      60
          '         Nov '    0       0        0       40      20      40
          '         Dec '    0       0        0       70      30       0
'Node' 2
          'Intake  Season '    7.6     1.5      1.0      0.0      0.0      2.5      0.0
          '        Annual '   14.0     3.7      2.5      0.0      0.0      2.5      0.0
          'Consume Season '    2.0     1.3      0.4      0.0      0.0      1.6      0.0
          '        Annual '    3.7     3.2      0.9      0.0      0.0      1.6      0.0
          'Intake     Jan '  100.0     0.0      0.0      0.0
          '           Feb '  100.0     0.0      0.0      0.0
          '           Mar '  100.0     0.0      0.0      0.0
          '           Apr '  100.0     0.0      0.0      0.0
          '           May '  100.0     0.0      0.0      0.0
          '           Jun '  100.0     0.0      0.0      0.0
          '           Jul '  100.0     0.0      0.0      0.0
          '           Aug '  100.0     0.0      0.0      0.0
          '           Sep '  100.0     0.0      0.0      0.0
          '           Oct '  100.0     0.0      0.0      0.0
          '           Nov '  100.0     0.0      0.0      0.0
          '           Dec '  100.0     0.0      0.0      0.0
          '         Total '  100.0     0.0      0.0      0.0
          '         Season'  100.0     0.0      0.0      0.0
          '         Annual'  100.0     0.0      0.0      0.0
          'Consume    Jan '  100.0     0.0      0.0      0.0
          '           Feb '  100.0     0.0      0.0      0.0
          '           Mar '  100.0     0.0      0.0      0.0
          '           Apr '  100.0     0.0      0.0      0.0
          '           May '  100.0     0.0      0.0      0.0
          '           Jun '  100.0     0.0      0.0      0.0
          '           Jul '  100.0     0.0      0.0      0.0
          '           Aug '  100.0     0.0      0.0      0.0
          '           Sep '  100.0     0.0      0.0      0.0
          '           Oct '  100.0     0.0      0.0      0.0
          '           Nov '  100.0     0.0      0.0      0.0
          '           Dec '  100.0     0.0      0.0      0.0
          '         Total '  100.0     0.0      0.0      0.0
          '         Season'  100.0     0.0      0.0      0.0
          '         Annual'  100.0     0.0      0.0      0.0
          'Min.Flow   Jan '    0.0     0.0      0.0      0.0
          '           Feb '    0.0     0.0      0.0      0.0
          '           Mar '    0.0     0.0      0.0      0.0
          '           Apr '    0.0     0.0      0.0      0.0
          '           May '    0.0     0.0      0.0      0.0
          '           Jun '    0.0     0.0      0.0      0.0
          '           Jul '    0.0     0.0      0.0      0.0
          '           Aug '    0.0     0.0      0.0      0.0
          '           Sep '    0.0     0.0      0.0      0.0
          '           Oct '    0.0     0.0      0.0      0.0
          '           Nov '    0.0     0.0      0.0      0.0
          '           Dec '    0.0     0.0      0.0      0.0
          '         Total '    0.0     0.0      0.0      0.0
          '         Season'    0.0     0.0      0.0      0.0
          '         Annual'    0.0     0.0      0.0      0.0
          'Average Supply '  922.3   762.1   1430.2   6227.0  11468.9  14744.3  14990.9   9104.5   6343.9   4263.8   2206.5  158.0
          '        Intake '    1.3     1.2      1.3      1.7      2.3      2.5      2.8      2.6      2.5      1.7      1.3    1.3
          '        Consume'    0.6     0.5      0.6      0.6      0.9      1.1      1.2      1.1      1.1      0.7      0.5    0.6
          '        Outflow'  921.7   761.6   1429.7   6226.4  11468.0  14743.3  14989.7   9103.4   6342.8   4263.2   2206.0 1057.4
          'Minimum Flow   '    0.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0    0.0
'Rsvr'  0
'Node'  3
          'Intake  Season '    1.8     1.1      1.7      0.0      4.3      5.0     26.4
          '        Annual '    3.3     2.6      4.1      0.0     10.8      5.0     37.0
          'Consume Season '      0.7       1.0       1.4       0.0       4.3       3.1      26.4
          '        Annual '      1.4       2.3       3.3       0.0      10.8       3.1      37.0
          'Intake     Jan '    100.0       0.0       0.0       0.0
          '           Feb '    100.0       0.0       0.0       0.0
          '           Mar '    100.0       0.0       0.0       0.0
          '           Apr '    100.0       0.0       0.0       0.0
          '           May '    100.0       0.0       0.0       0.0
          '           Jun '    100.0       0.0       0.0       0.0
          '           Jul '    100.0       0.0       0.0       0.0
          '           Aug '    100.0       0.0       0.0       0.0
          '           Sep '    100.0       0.0       0.0       0.0
          '           Oct '    100.0       0.0       0.0       0.0
          '           Nov '    100.0       0.0       0.0       0.0
          '           Dec '    100.0       0.0       0.0       0.0
          '         Total '    100.0       0.0       0.0       0.0
          '         Season'    100.0       0.0       0.0       0.0
          '         Annual'    100.0       0.0       0.0       0.0
          'Consume    Jan '    100.0       0.0       0.0       0.0
          '           Feb '    100.0       0.0       0.0       0.0
          '           Mar '    100.0       0.0       0.0       0.0
          '           Apr '    100.0       0.0       0.0       0.0
          '           May '    100.0       0.0       0.0       0.0
          '           Jun '    100.0       0.0       0.0       0.0
          '           Jul '    100.0       0.0       0.0       0.0
          '           Aug '    100.0       0.0       0.0       0.0
          '           Sep '    100.0       0.0       0.0       0.0
          '           Oct '    100.0       0.0       0.0       0.0
          '           Nov '    100.0       0.0       0.0       0.0
          '           Dec '    100.0       0.0       0.0       0.0
          '         Total '    100.0       0.0       0.0       0.0
          '         Season'    100.0       0.0       0.0       0.0
          '         Annual'    100.0       0.0       0.0       0.0
          'Min.Flow   Jan '      0.0       0.0       0.0       0.0
          '           Feb '      0.0       0.0       0.0       0.0
          '           Mar '      0.0       0.0       0.0       0.0
          '           Apr '      0.0       0.0       0.0       0.0
          '           May '      0.0       0.0       0.0       0.0
          '           Jun '      0.0       0.0       0.0       0.0
          '           Jul '      0.0       0.0       0.0       0.0
          '           Aug '      0.0       0.0       0.0       0.0
          '           Sep '      0.0       0.0       0.0       0.0
          '           Oct '      0.0       0.0       0.0       0.0
          '           Nov '      0.0       0.0       0.0       0.0
          '           Dec '      0.0       0.0       0.0       0.0
          '         Total '      0.0       0.0       0.0       0.0
          '         Season'      0.0       0.0       0.0       0.0
          '         Annual'      0.0       0.0       0.0       0.0
          'Average Supply '    938.9     783.2    1906.2    8528.9   12295.9   14892.6   16878.4    9643.3    7024.1    4511.1    2412.6    1125.5
          '        Intake '      1.8       1.7       1.2       1.8       2.3       2.8       3.4       2.7       2.7       1.9       1.7       1.9
          '        Consume'      1.5       1.5       1.0       1.6       1.9       2.2       2.6       2.0       2.0       1.6       1.5       1.6
          '        Outflow'    937.4     781.7    1905.2    8528.3   12294.0   14890.5   16875.9    9641.3    7022.1    4509.5    2411.1    1123.8
          'Minimum Flow   '      0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
'Rsvr'  0
'Node'  4
          'Intake  Season '      0.9       0.3       1.6       0.0       0.0       2.5       0.0
          '        Annual '      1.7       0.8       3.9       0.0       0.0       2.5       0.0
          'Consume Season '      0.3       0.3       1.4       0.0       0.0       1.6       0.0
          '        Annual '      0.6       0.7       3.2       0.0       0.0       1.6       0.0
          'Intake     Jan '     20.0       0.0       0.0      80.0
          '           Feb '     30.0       0.0       0.0      70.0
          '           Mar '     90.0       0.0       0.0      10.0
          '           Apr '    100.0       0.0       0.0       0.0
          '           May '    100.0       0.0       0.0       0.0
          '           Jun '    100.0       0.0       0.0       0.0
          '           Jul '    100.0       0.0       0.0       0.0
          '           Aug '    100.0       0.0       0.0       0.0
          '           Sep '    100.0       0.0       0.0       0.0
          '           Oct '     70.0       0.0       0.0      30.0
          '           Nov '    100.0       0.0       0.0       0.0
          '           Dec '     90.0       0.0       0.0      10.0
          '         Total '     83.3       0.0       0.0      16.7
          '         Season'    100.0       0.0       0.0       0.0
          '         Annual'    100.0       0.0       0.0       0.0
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```
         'Consume  Jan  '   20.0    0.0    0.0   80.0
         '         Feb  '   30.0    0.0    0.0   70.0
         '         Mar  '   90.0    0.0    0.0   10.0
         '         Apr  '  100.0    0.0    0.0    0.0
         '         May  '  100.0    0.0    0.0    0.0
         '         Jun  '  100.0    0.0    0.0    0.0
         '         Jul  '  100.0    0.0    0.0    0.0
         '         Aug  '  100.0    0.0    0.0    0.0
         '         Sep  '  100.0    0.0    0.0    0.0
         '         Oct  '   70.0    0.0    0.0   30.0
         '         Nov  '  100.0    0.0    0.0    0.0
         '         Dec  '   90.0    0.0    0.0   10.0
         '         Total '  83.3    0.0    0.0   16.7
         '         Season' 100.0    0.0    0.0    0.0
         '         Annual' 100.0    0.0    0.0    0.0
         'Min.Flow  Jan  '   0.0    0.0    0.0    0.0
         '          Feb  '   0.0    0.0    0.0    0.0
         '          Mar  '   0.0    0.0    0.0    0.0
         '          Apr  '   0.0    0.0    0.0    0.0
         '          May  '   0.0    0.0    0.0    0.0
         '          Jun  '   0.0    0.0    0.0    0.0
         '          Jul  '   0.0    0.0    0.0    0.0
         '          Aug  '   0.0    0.0    0.0    0.0
         '          Sep  '   0.0    0.0    0.0    0.0
         '          Oct  '   0.0    0.0    0.0    0.0
         '          Nov  '   0.0    0.0    0.0    0.0
         '          Dec  '   0.0    0.0    0.0    0.0
         '         Total '   0.0    0.0    0.0    0.0
         '         Season'   0.0    0.0    0.0    0.0
         '         Annual'   0.0    0.0    0.0    0.0
         'Average Supply '   4.7    5.9  129.2  624.8  228.8   49.9  524.1  156.4  194.5   68.7   55.6   18.3
         '        Intake '   0.5    0.5    0.5    0.5    0.8    1.1    1.3    1.1    1.1    0.5    0.5    0.5
         '        Consume'   0.4    0.4    0.4    0.4    0.5    0.7    0.9    0.7    0.7    0.4    0.4    0.4
         '        Outflow'   4.5    5.7  128.9  624.4  228.2   49.2  523.2  155.6  193.8   68.4   55.2   18.0
         'Minimum Flow   '   0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'Rsvr' 0
'Node' 5
         'Intake  Season '   0.0    0.1    0.0    0.4    0.0   60.9    0.0
         '        Annual '   0.1    0.3    0.0    1.1    0.0   60.9    0.0
         'Consume Season '   0.0    0.1    0.0    0.1    0.0   38.4    0.0
         '        Annual '   0.0    0.3    0.0    0.3    0.0   38.4    0.0
         'Intake    Jan  '  20.0    0.0    0.0   80.0
         '          Feb  '  30.0    0.0    0.0   70.0
         '          Mar  '  90.0    0.0    0.0   10.0
         '          Apr  ' 100.0    0.0    0.0    0.0
         '          May  ' 100.0    0.0    0.0    0.0
         '          Jun  '  50.0   10.0    0.0   40.0
         '          Jul  '  70.0    0.0   10.0   20.0
         '          Aug  '  80.0   20.0    0.0    0.0
         '          Sep  '  90.0    0.0    0.0   10.0
         '          Oct  '  70.0    0.0    0.0   30.0
         '          Nov  ' 100.0    0.0    0.0    0.0
         '          Dec  '  90.0    0.0    0.0   10.0
         '         Total '  74.2    2.5    0.8   22.5
         '         Season'  90.0    0.0    0.0   10.0
         '         Annual' 100.0    0.0    0.0    0.0
         'Consume   Jan  '  20.0    0.0    0.0   80.0
         '          Feb  '  30.0    0.0    0.0   70.0
         '          Mar  '  90.0    0.0    0.0   10.0
         '          Apr  ' 100.0    0.0    0.0    0.0
         '          May  ' 100.0    0.0    0.0    0.0
         '          Jun  '  60.0   40.0    0.0    0.0
         '          Jul  '  80.0   10.0   10.0    0.0
         '          Aug  ' 100.0    0.0    0.0    0.0
         '          Sep  '  90.0    0.0    0.0   10.0
         '          Oct  '  70.0    0.0    0.0   30.0
         '          Nov  ' 100.0    0.0    0.0    0.0
         '          Dec  '  90.0    0.0    0.0   10.0
         '         Total '  77.5    4.2    0.8   17.5
         '         Season'  90.0   10.0    0.0    0.0
         '         Annual' 100.0    0.0    0.0    0.0
         'Min.Flow  Jan  '   0.0    0.0    0.0    0.0
         '          Feb  '   0.0    0.0    0.0    0.0
```

```
          '         Mar  '    0.0      0.0      0.0      0.0
          '         Apr  '    0.0      0.0      0.0      0.0
          '         May  '    0.0      0.0      0.0      0.0
          '         Jun  '    0.0      0.0      0.0      0.0
          '         Jul  '    0.0      0.0      0.0      0.0
          '         Aug  '    0.0      0.0      0.0      0.0
          '         Sep  '    0.0      0.0      0.0      0.0
          '         Oct  '    0.0      0.0      0.0      0.0
          '         Nov  '    0.0      0.0      0.0      0.0
          '         Dec  '    0.0      0.0      0.0      0.0
          '        Total '    0.0      0.0      0.0      0.0
          '        Season'    0.0      0.0      0.0      0.0
          '        Annual'    0.0      0.0      0.0      0.0
          'Average Supply '   4.8      6.1    134.8    652.4    245.5     56.0    549.8    168.9    200.4     71.3     58.3   19.3
          '       Intake '    0.1      0.1      0.1      0.1      5.3     11.7     18.7     12.6     13.1      0.1      0.1    0.1
          '       Consume'    0.0      0.0      0.0      0.0      3.3      7.4     11.8      7.9      8.2      0.1      0.0    0.0
          '       Outflow'    4.8      6.0    134.7    652.4    242.1     48.6    538.2    161.0    192.5     71.2     58.3   19.3
          'Minimum Flow  '    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0    0.0
'Rsvr' 0
'Node' 6
          'Intake  Season '   0.8      0.8      1.[illegible]      0.0      0.0     69.9     38.7
          '        Annual '   1.4      1.9      2.4      0.0      0.0     69.9     53.0
          'Consume Season '   0.3      0.7      0.9      0.0      0.0     44.1     38.7
          '        Annual '   0.6      1.6      2.2      0.0      0.0     44.1     53.0
          'Intake     Jan  '  100.0      0.0      0.0      0.0
          '           Feb  '  100.0      0.0      0.0      0.0
          '           Mar  '  100.0      0.0      0.0      0.0
          '           Apr  '  100.0      0.0      0.0      0.0
          '           May  '  100.0      0.0      0.0      0.0
          '           Jun  '  100.0      0.0      0.0      0.0
          '           Jul  '  100.0      0.0      0.0      0.0
          '           Aug  '  100.0      0.0      0.0      0.0
          '           Sep  '  100.0      0.0      0.0      0.0
          '           Oct  '  100.0      0.0      0.0      0.0
          '           Nov  '  100.0      0.0      0.0      0.0
          '           Dec  '  100.0      0.0      0.0      0.0
          '          Total '  100.0      0.0      0.0      0.0
          '          Season'  100.0      0.0      0.0      0.0
          '          Annual'  100.0      0.0      0.0      0.0
          'Consume    Jan  '  100.0      0.0      0.0      0.0
          '           Feb  '  100.0      0.0      0.0      0.0
          '           Mar  '  100.0      0.0      0.0      0.0
          '           Apr  '  100.0      0.0      0.0      0.0
          '           May  '  100.0      0.0      0.0      0.0
          '           Jun  '  100.0      0.0      0.0      0.0
          '           Jul  '  100.0      0.0      0.0      0.0
          '           Aug  '  100.0      0.0      0.0      0.0
          '           Sep  '  100.0      0.0      0.0      0.0
          '           Oct  '  100.0      0.0      0.0      0.0
          '           Nov  '  100.0      0.0      0.0      0.0
          '           Dec  '  100.0      0.0      0.0      0.0
          '          Total '  100.0      0.0      0.0      0.0
          '          Season'  100.0      0.0      0.0      0.0
          '          Annual'  100.0      0.0      0.0      0.0
          'Min.Flow   Jan  '    0.0      0.0      0.0      0.0
          '           Feb  '    0.0      0.0      0.0      0.0
          '           Mar  '    0.0      0.0      0.0      0.0
          '           Apr  '    0.0      0.0      0.0      0.0
          '           May  '    0.0      0.0      0.0      0.0
          '           Jun  '    0.0      0.0      0.0      0.0
          '           Jul  '    0.0      0.0      0.0      0.0
          '           Aug  '    0.0      0.0      0.0      0.0
          '           Sep  '    0.0      0.0      0.0      0.0
          '           Oct  '    0.0      0.0      0.0      0.0
          '           Nov  '    0.0      0.0      0.0      0.0
          '           Dec  '    0.0      0.0      0.0      0.0
          '          Total '    0.0      0.0      0.0      0.0
          '          Season'    0.0      0.0      0.0      0.0
          '          Annual'    0.0      0.0      0.0      0.0
          'Average Supply '   962.6    813.7   2611.4  11968.2  13560.6  15175.6  19791.4  10518.8   8107.7   4882.9   2719.9 1225.5
          '       Intake '      0.4      0.4      0.4      0.5      6.5     13.8     21.9     14.9     15.4      0.5      0.4    0.4
          '       Consume'      0.4      0.3      0.4      0.4      4.2      8.8     13.9      9.4      9.7      0.4      0.3    0.4
          '       Outflow'    962.2    813.3   2611.1  11967.8  13556.4  15167.1  19777.5  10509.4   8097.9   4882.5   2719.6 1225.1
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        'Minimum Flow    '    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
'Rsvr' 0
'Node' 7
        'Intake  Season '     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        '        Annual '     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        'Consume Season '     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        '        Annual '     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        'Intake     Jan '   100.0     0.0     0.0     0.0
        '           Feb '   100.0     0.0     0.0     0.0
        '           Mar '   100.0     0.0     0.0     0.0
        '           Apr '   100.0     0.0     0.0     0.0
        '           May '   100.0     0.0     0.0     0.0
        '           Jun '   100.0     0.0     0.0     0.0
        '           Jul '   100.0     0.0     0.0     0.0
        '           Aug '   100.0     0.0     0.0     0.0
        '           Sep '   100.0     0.0     0.0     0.0
        '           Oct '   100.0     0.0     0.0     0.0
        '           Nov '   100.0     0.0     0.0     0.0
        '           Dec '   100.0     0.0     0.0     0.0
        '         Total '   100.0     0.0     0.0     0.0
        '         Season'   100.0     0.0     0.0     0.0
        '         Annual'   100.0     0.0     0.0     0.0
        'Consume    Jan '   100.0     0.0     0.0     0.0
        '           Feb '   100.0     0.0     0.0     0.0
        '           Mar '   100.0     0.0     0.0     0.0
        '           Apr '   100.0     0.0     0.0     0.0
        '           May '   100.0     0.0     0.0     0.0
        '           Jun '   100.0     0.0     0.0     0.0
        '           Jul '   100.0     0.0     0.0     0.0
        '           Aug '   100.0     0.0     0.0     0.0
        '           Sep '   100.0     0.0     0.0     0.0
        '           Oct '   100.0     0.0     0.0     0.0
        '           Nov '   100.0     0.0     0.0     0.0
        '           Dec '   100.0     0.0     0.0     0.0
        '         Total '   100.0     0.0     0.0     0.0
        '         Season'   100.0     0.0     0.0     0.0
        '         Annual'   100.0     0.0     0.0     0.0
        'Min.Flow   Jan '     0.0     0.0     0.0     0.0
        '           Feb '     0.0     0.0     0.0     0.0
        '           Mar '     0.0     0.0     0.0     0.0
        '           Apr '     0.0     0.0     0.0     0.0
        '           May '     0.0     0.0     0.0     0.0
        '           Jun '     0.0     0.0     0.0     0.0
        '           Jul '     0.0     0.0     0.0     0.0
        '           Aug '     0.0     0.0     0.0     0.0
        '           Sep '     0.0     0.0     0.0     0.0
        '           Oct '     0.0     0.0     0.0     0.0
        '           Nov '     0.0     0.0     0.0     0.0
        '           Dec '     0.0     0.0     0.0     0.0
        '         Total '     0.0     0.0     0.0     0.0
        '         Season'     0.0     0.0     0.0     0.0
      '         Annual'     0.0     0.0     0.0     0.0
      'Average Supply '  9595.0  9243.3 15805.4 28451.4 45095.1 73922.5 66886.8 39155.7 24840.9 21660.5 13901.2 10792.4
      '        Intake '     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      '        Consume'     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      '        Outflow'  9595.0  9243.3 15805.4 28451.4 45095.1 73922.5 66886.8 39155.7 24840.9 21660.5 13901.2 10792.4
      'Minimum Flow   '     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
'Rsvr' 0
'Node' 8
      'Intake  Season '     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      '        Annual '     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      'Consume Season '     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      '        Annual '     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      'Intake     Jan '   100.0     0.0     0.0     0.0
      '           Feb '   100.0     0.0     0.0     0.0
      '           Mar '   100.0     0.0     0.0     0.0
      '           Apr '   100.0     0.0     0.0     0.0
      '           May '   100.0     0.0     0.0     0.0
      '           Jun '   100.0     0.0     0.0     0.0
      '           Jul '   100.0     0.0     0.0     0.0
      '           Aug '   100.0     0.0     0.0     0.0
      '           Sep '   100.0     0.0     0.0     0.0
      '           Oct '   100.0     0.0     0.0     0.0
```

```
        '          Nov  '  100.0      0.0      0.0      0.0
        '          Dec  '  100.0      0.0      0.0      0.0
        '          Total '  100.0      0.0      0.0      0.0
        '          Season'  100.0      0.0      0.0      0.0
        '          Annual'  100.0      0.0      0.0      0.0
        'Consume   Jan  '  100.0      0.0      0.0      0.0
        '          Feb  '  100.0      0.0      0.0      0.0
        '          Mar  '  100.0      0.0      0.0      0.0
        '          Apr  '  100.0      0.0      0.0      0.0
        '          May  '  100.0      0.0      0.0      0.0
        '          Jun  '  100.0      0.0      0.0      0.0
        '          Jul  '  100.0      0.0      0.0      0.0
        '          Aug  '  100.0      0.0      0.0      0.0
        '          Sep  '  100.0      0.0      0.0      0.0
        '          Oct  '  100.0      0.0      0.0      0.0
        '          Nov  '  100.0      0.0      0.0      0.0
        '          Dec  '  100.0      0.0      0.0      0.0
        '          Total '  100.0      0.0      0.0      0.0
        '          Season'  100.0      0.0      0.0      0.0
        '          Annual'  100.0      0.0      0.0      0.0
        'Min.Flow  Jan  '    0.0      0.0      0.0      0.0
        '          Feb  '    0.0      0.0      0.0      0.0
        '          Mar  '    0.0      0.0      0.0      0.0
        '          Apr  '    0.0      0.0      0.0      0.0
        '          May  '    0.0      0.0      0.0      0.0
        '          Jun  '    0.0      0.0      0.0      0.0
        '          Jul  '    0.0      0.0      0.0      0.0
        '          Aug  '    0.0      0.0      0.0      0.0
        '          Sep  '    0.0      0.0      0.0      0.0
        '          Oct  '    0.0      0.0      0.0      0.0
        '          Nov  '    0.0      0.0      0.0      0.0
        '          Dec  '    0.0      0.0      0.0      0.0
        '          Total '    0.0      0.0      0.0      0.0
        '          Season'    0.0      0.0      0.0      0.0
        '          Annual'    0.0      0.0      0.0      0.0
        'Average Supply ' 9595.0   9243.3  15805.4  28451.4  45095.1  73922.5  66886.8  39155.7  24840.9  21660.5  13901.2  10792.4
        '        Intake '    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
        '        Consume'    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
        '        Outflow' 9595.0   9243.3  15805.4  28451.4  45095.1  73922.5  66886.8  39155.7  24840.9  21660.5  13901.2  10792.4
        'Minimum Flow   '    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
'Rsvr' 0
```

APPENDIX C29

DESCRIPTION OF DATA FILES

FILE 29
RESERVOIR PLOTTER FILE

C29 - RESERVOIR PLOTTER FILE

File Name: PLOTTER.RES

```
Run Description, Line 1 (string)

Run Description, Line 2 (string)

Run Description, Line 2 (string)

Forecast Year (integer)

Number of Reservoirs (integer)

descriptor (string) ---------------------------------> repeat
Reservoir Number (integer)                           > for
Reservoir Name (string)                              > each
                                                     > reservoir
descriptor (string)                                  >
Maximum Elevation (real), m                          >
                                                     >
descriptor (string)                                  >
Minimum Elevation (real), m                          >
                                                     >
descriptor (string)                                  >
Upper Rule Curve Elevation* (real), m                >
                                                     >
descriptor (string)                                  >
Lower Rule Curve Elevation* (real), m                >
                                                     >
descriptor (string)                                  >
Maximum Outflow* (real), m                           >
                                                     >
descriptor (string)                                  >
Minimum Outflow* (real), m                           >
                                                     >
descriptor (string)                                  >
Target Outflow* (real), m ---------------------------->

Simulation Year (integer) --------------------------------> repeat
                                                          > for
Reservoir Number (integer) --------------> repeat         > each
descriptor (string)                      > for            > simulation
Elevation* (real), m                     > each           > year
                                         > reservoir      >
descriptor (string)                      >                >
Inflow* (real), Mm3                      >                >
                                         >                >
descriptor (string)                      >                >
Outflow* (real), Mm3 -------------------> ----------->
```

---

*One value for each month.

file: PLOTTER.RES

```
          'TEST RUN FOR USER MANUAL                                          '
          '                                                                  '
          'with reservoir drawdowns & with consumption cutbacks              '
           1999
              1
'Res.'  1 'Reservoir No. 1         '
          'max.   elevn'  951.0
          'min.   elevn'  926.0
          'upper  r.c. '  948.0  948.0  948.0  948.0  948.0  948.0  948.0  948.0  948.0  948.0  948.0  948.0
          'lower  r.c. '  940.0  935.0  930.0  930.0  935.0  940.0  945.0  945.0  945.0  945.0  945.0  945.0
          'max.   flow '  500.0  500.0  500.0  500.0  500.0  500.0  500.0  500.0  500.0  500.0  500.0  500.0
          'min.   flow '   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0
          'target flow '   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0   16.0
 1912
        1 'elevation   '  948.0,  948.0,  948.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,    951.0,  948.0
          'inflow      '  116.0,  131.0,  242.0,   924.0,  1904.0,  1904.0,  4860.0,  2400.0,  2183.0,  1281.0,    621.0,  286.0
          'outflow     '   91.8,  131.1,  242.1,   904.8,  1904.2,  1903.9,  4860.2,  2399.7,  2182.4,  1280.7,    621.1,  304.7
 1913
        1 'elevation   '  948.0,  948.0,  948.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,    948.0,  948.0
          'inflow      '  200.0,  190.0,  197.0,  1872.0,  1975.0,  2382.0,  2525.0,  1581.0,   860.0,   589.0,    397.0,  157.0
          'outflow     '  200.1,  190.3,  197.1,  1852.6,  1974.8,  2381.7,  2524.3,  1580.4,   859.3,   588.6,    416.3,  157.0
 1914
        1 'elevation   '  948.0,  948.0,  948.0,   948.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,    948.0,  948.0
          'inflow      '  133.0,  143.0,  183.0,   434.0,   919.0,  1767.0,  1132.0,   630.0,   528.0,   693.0,    377.0,  157.0
          'outflow     '  133.2,  143.1,  183.0,   434.3,   900.9,  1767.7,  1131.6,   629.3,   527.7,   692.7,    396.6,  157.3
 1915
        1 'elevation   '  948.0,  948.0,  948.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,    951.0,  948.0
          'inflow      '  133.0,  130.0,  291.0,   602.0,  2146.0,  5928.0,  8067.0,  3910.0,  1904.0   1413.0,    575.0,  250.0
          'outflow     '  133.2,  130.1,  290.8,   582.6,  2146.4,  5928.2,  8066.7,  3909.2,  1903.6,  1412.8,    575.1,  268.7
 1916
        1 'elevation   '  948.0,  948.0,  948.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,    951.0,  948.0
          'inflow      '  200.0,  180.0,  399.0,  1020.0,  1726.0,  5581.0,  4036.0,  3613.0,  3476.0,  1643.0,    882.0,  406.0
          'outflow     '  200.1,  180.1,  398.9,  1000.6,  1726.1,  5580.8,  4036.1,  3612.8,  3475.8,  1642.3,    882.0,  424.8
 1917
        1 'elevation   '  948.0,  948.0,  948.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,    951.0,  948.0
          'inflow      '  294.0,  229.0,  241.0,  2012.0,  4365.0,  4291.0,  1776.0,   999.0,   888.0,   704.0,    508.0,  195.0
          'outflow     '  294.2,  229.0,  240.9,  1992.8,  4364.9,  4290.4,  1775.2,   998.4,   887.5,   703.6,    508.0,  213.8
 1918
        1 'elevation   '  948.0,  948.0,  951.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,   948.0,    948.0,  948.0
          'inflow      '  219.0,  185.0,  679.0,  1370.0,   914.0,  1727.0,   893.0,   852.0,   642.0,   469.0,    250.0,  132.0
          'outflow     '  219.2,  185.1,  660.3,  1369.9,   913.7,  1726.6,   892.3,   851.5,   641.4,   487.1,    250.0,  132.1
 1919
        1 'elevation   '  948.0,  948.0,  948.0,   951.0,   951.0,   951.0,   951.0,   951.0,   951.0,   948.0,    948.0,  948.0
          'inflow      '  165.0,  130.0,  118.0,   751.0,   995.0,   880.0,   663.0,   959.0,   556.0,   318.0,    176.0,  101.0
          'outflow     '  165.1,  130.1,  118.1,   732.0,   995.0,   879.4,   662.3,   958.3,   555.6,   336.2,    176.3,  101.1
 1920
        1 'elevation   '  948.0,  948.0,  948.0,   951.0,   951.0,   951.0,   951.0,   951.0,   948.0,   948.0,    948.0,  948.0
          'inflow      '  106.0,  107.0,  139.0,  1490.0,  4415.0,  1665.0,  2130.0,   795.0,   394.0,   270.0,    143.0,   95.0
          'outflow     '  106.2,  107.1,  139.2,  1470.9,  4414.9,  1664.6,  2129.4,   794.2,   412.8,   269.7,    143.0,   95.1
 1921
        1 'elevation   '  948.0,  948.0,  948.0,   951.0,   951.0,   951.0,   951.0,   951.0,   948.0,   948.0,    948.0,  948.0
          'inflow      '   98.0,   84.0,   86.0,  1165.0,  1270.0,  1271.0,   875.0,   631.0,   335.0,   267.0,    147.0,   81.0
          'outflow     '   98.1,   84.1,   86.2,  1145.9,  1269.8,  1270.5,   874.5,   630.3,   353.7,   266.5,    147.1,   81.0
```

APPENDIX C30

DESCRIPTION OF DATA FILES

FILE 30
HYDRO ENERGY PLOTTER FILE

C30 - MODULE 10 HYDRO ENERGY PLOTTER FILE

File Name: PLOTTER.HYD

```
Run Descriptor (string) ------------------> repeat for each line
                                            of description
descriptor (string)
Year (integer)

descriptor (string)
First Simulation Year (integer)

descriptor (string)
No. of Years of Simulation (integer)

descriptor (string)
No. of Hydro Stations (integer)

Simulation Year (integer) -------------------------------> repeat
                                                         > for
descriptor (string) ------------------------->   repeat > each
Node Number (integer)                        > for each > simulation
Energy* (real), GW·h ------------------------>  station > year
```

---

*One value for each month.

file: PLOTTER.HYD

```
              'TEST RUN FOR USER MANUAL                                        '
              '                                                                '
              'with reservoir drawdowns & with consumption cutbacks            '
'Forecast Year' 1999
'First Year   ' 1912
'No. Years    '   10
'No. Stations '    1

1912
    'Node:'  8    138.4,   125.0,   138.4,   133.9,   138.4,   133.9,    138.4,    138.4,   133.9,   138.4,   133.9,  138.4
1913
    'Node:'  8    138.4,   125.0,   138.4,   133.9,   138.4,   133.9,    138.4,    138.4,   133.9,   138.4,   133.9,  138.4
1914
    'Node:'  8    138.4,   125.0,   138.4,   133.9,   138.4,   133.9,    138.4,    138.4,   133.9,   138.4,   133.9,  138.4
1915
    'Node:'  8    138.4,   125.0,   138.4,   133.9,   138.4,   133.9,    138.4,    138.4,   133.9,   138.4,   133.9,  138.4
1916
    'Node:'  8    138.4,   125.0,   138.4,   133.9,   138.4,   133.9,    138.4,    138.4,   133.9,   138.4,   133.9,  138.4
1917
    'Node:'  8    138.4,   125.0,   138.4,   133.9,   138.4,   133.9,    138.4,    138.4,   133.9,   138.4,   133.9,  138.4
1918
    'Node:'  8    138.4,   125.0,   138.4,   133.9,   138.4,   133.9,    138.4,    138.4,   133.9,   138.4,   133.9,  138.4
1919
    'Node:'  8    138.4,   125.0,   138.4,   133.9,   138.4,   133.9,    138.4,    138.4,   133.9,   138.4,   133.9,  138.4
1920
    'Node:'  8    138.4,   125.0,   138.4,   133.9,   138.4,   133.9,    138.4,    138.4,   133.9,   138.4,   133.9,  138.4
1921
    'Node:'  8    138.4,   125.0,   138.4,   133.9,   138.4,   133.9,    138.4,    138.4,   133.9,   138.4,   133.9,  138.4
```

APPENDIX C31

DESCRIPTION OF DATA FILES

FILE 30
REGULATED GAUGE HYDROLOGY

APPENDIX C31 - REGULATED GAUGE HYDROLOGY FILE

File Name: Rxxxxxxx.DAT

Note: The format for this file is the same as that described in Appendix C4.

APPENDIX C32

DESCRIPTION OF DATA FILES

FILE 32
IMPERIAL GAUGE HYDROLOGY

C32 - IMPERIAL GAUGE HYDROLOGY FILE

File Name: Hxxxxxxx.CFS

Note: The format for this file is the same as that described in Appendix C4 except that the streamflow values must be in imperial units of cubic feet per second (ft^3/s).

APPENDIX D

SAMPLE OUTPUT

APPENDIX D1

SAMPLE OUTPUT

MODULE 1
List General Data Base

```
file:  MODULE1.OUT

         General Data Base:  DATABASE.DAT                         Date: TEST RUN 25/03/88     Page:  1


       Month   Name    No. Days
       -----   -----   --------
         1      Jan       31
         2      Feb       28
         3      Mar       31
         4      Apr       30
         5      May       31
         6      Jun       30
         7      Jul       31
         8      Aug       31
         9      Sep       30
        10      Oct       31
        11      Nov       30
        12      Dec       31

       Irrigation months:  May  through  Sep

       Economic Regions
       ----------------
       Number   Name
       ------   ----
          1     BC
          2     Alberta
          3     Sask
          4     Manitoba
          5     Ontario
          6     Quebec
          7     NB
          8     PEI
          9     NS
         10     Nfld

       Water Use Categories
       --------------------
       Number   Name
       ------   ----------
          1     domestic
          2     livestock
          3     industrial
          4     irrigation

                                                    Water  Use  Priorities
       Province   Name             Region       lowest                                 highest
       --------   ---------------  --------   ----------   ----------   ----------   ----------
          1       B. C.            BC         livestock    irrigation   industrial   domestic
          2       Alberta          Alberta    industrial   livestock    irrigation   domestic
          3       Saskatchewan     Alberta    livestock    irrigation   industrial   domestic
          4       Manitoba         Alberta    livestock    irrigation   industrial   domestic
```

```
Default cutback increments
--------------------------

Province      Category     Increments
--------      --------     ----------

B. C.         domestic      0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              livestock     0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              industrial    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              irrigation    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100

Alberta       domestic      0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              livestock     0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              industrial    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              irrigation    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100

Saskatchewan  domestic      0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              livestock     0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              industrial    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              irrigation    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100

Manitoba      domestic      0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              livestock     0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              industrial    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
              irrigation    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
```

```
            General Data Base:  DATABASE.DAT                           Date: TEST RUN 25/03/88    Page:  3

Domestic                  Province     Intake   Consumd                 Seasonal Distribution Factors
--------                  --------     ------   -------                 -----------------------------
                                       1/day/      %      Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
                                       person            ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
Urban
      1  non-industrial
                          B. C.         575.0    20.00   0.70  0.70  0.70  1.00  1.30  1.30  1.30  1.30  1.30  1.00  0.70  0.70
                          Alberta       483.0    20.00   0.70  0.70  0.70  1.00  1.30  1.30  1.30  1.30  1.30  1.00  0.70  0.70
                          Saskatchewan  453.0    20.00   0.70  0.70  0.70  1.00  1.30  1.30  1.30  1.30  1.30  1.00  0.70  0.70
                          Manitoba      355.0    20.00   0.70  0.70  0.70  1.00  1.30  1.30  1.30  1.30  1.30  1.00  0.70  0.70
Rural
      1  general
                          B. C.         182.0    70.00   0.70  0.70  0.70  1.00  1.30  1.30  1.30  1.30  1.30  1.00  0.70  0.70
                          Alberta       137.0    70.00   0.70  0.70  0.70  1.00  1.30  1.30  1.30  1.30  1.30  1.00  0.70  0.70
                          Saskatchewan  137.0    70.00   0.70  0.70  0.70  1.00  1.30  1.30  1.30  1.30  1.30  1.00  0.70  0.70
                          Manitoba      137.0    70.00   0.70  0.70  0.70  1.00  1.30  1.30  1.30  1.30  1.30  1.00  0.70  0.70


         Livestock            Intake      Consumption
         ---------          ----------    -----------
                            1/day/head         %

      1  beef cattle          20.40          90.00
      2  dairy cattle         54.00          70.00
      3  horses               68.00          70.00
      4  pigs                  6.00          70.00
      5  sheep                 3.50          95.00
      6  poultry               0.30          95.00
```

```
        General Data Base:  DATABASE.DAT                                       Date: TEST RUN 25/03/88      Page:  4

Crop  Crop                                                                          Seasonal  Distribution
Type  Name Parameters                                       Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
----  ---- ----------                                       ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----

  1   wheat (grains)
          crop factors:                                     0.00  0.00  0.00  0.00  0.25  0.82  1.11  0.47  0.25  0.00  0.00  0.00
          min. optimal depletion:            0.150
          max. optimal depletion:            0.600
          depln eqn constant, A:             1.309
          depln eqn constant, B:            -0.602
          depln adjustment factors:                         0.00  0.00  0.00  0.00  0.80  1.00  1.00  1.20  1.00  0.00  0.00  0.00
          max. rooting depth:                1.200 m.
          root depth adjustment factors:                    0.00  0.00  0.00  0.00  0.22  0.64  0.98  1.00  1.00  0.00  0.00  0.00
          soil salinity, 90% yield:          7.400 mmohs/cm
          soil salinity, 0 % yield:         20.000 mmohs/cm
          salinity adjustment factors:                      0.00  0.00  0.00  0.00  0.60  1.00  1.00  1.00  1.00  0.00  0.00  0.00
          DF  at ETF= 0.95:                  0.700
          DF  at ETF= 0.10:                  0.930
          ETF at DF = 0.80:                  0.830

  2   alfalfa (forages)
          crop factors:                                     0.00  0.00  0.00  0.00  0.80  0.94  0.95  0.83  0.73  0.00  0.00  0.00
          min. optimal depletion:            0.150
          max. optimal depletion:            0.700
          depln eqn constant, A:             1.309
          depln eqn constant, B:            -0.602
          depln adjustment factors:                         0.00  0.00  0.00  0.00  1.00  1.00  1.00  1.00  1.00  0.00  0.00  0.00
          max. rooting depth:                1.500 m.
          root depth adjustment factors:                    0.00  0.00  0.00  0.00  1.00  1.00  1.00  1.00  1.00  0.00  0.00  0.00
          soil salinity, 90% yield:          3.400 mmohs/cm
          soil salinity, 0 % yield:         15.500 mmohs/cm
          salinity adjustment factors:                      0.00  0.00  0.00  0.00  1.00  1.00  1.00  1.00  1.00  0.00  0.00  0.00
          DF  at ETF= 0.95:                  0.750
          DF  at ETF= 0.10:                  0.950
          ETF at DF = 0.80:                  0.900

  3   potato (specialities)
          crop factors:                                     0.00  0.00  0.00  0.00  0.29  0.64  0.89  0.92  0.52  0.00  0.00  0.00
          min. optimal depletion:            0.000
          max. optimal depletion:            0.250
          depln eqn constant, A:             0.854
          depln eqn constant, B:            -0.677
          depln adjustment factors:                         0.00  0.00  0.00  0.00  1.00  0.90  0.90  1.00  1.10  0.00  0.00  0.00
          max. rooting depth:                0.600 m.
          root depth adjustment factors:                    0.00  0.00  0.00  0.00  0.31  0.70  1.00  1.00  1.00  0.00  0.00  0.00
          soil salinity, 90% yield:          2.500 mmohs/cm
          soil salinity, 0 % yield:         10.000 mmohs/cm
          salinity adjustment factors:                      0.00  0.00  0.00  0.00  1.00  1.00  1.00  1.00  1.00  0.00  0.00  0.00
          DF  at ETF= 0.95:                  0.600
          DF  at ETF= 0.10:                  0.900
          ETF at DF = 0.80:                  0.720
          General Data Base:  DATABASE.DAT                                    Date: TEST RUN 25/03/88     Page:  5

Soil                          Moisture   Leaching    Percolation
Type   Name                   Capacity   Efficiency   Efficiency
----   ----                   --------   ----------  -----------
                                mm/m         %            %

  1    light                    60.00       90.0         40.0
  2    medium                  140.00       70.0         20.0
  3    med.-heavy              170.00       55.0         15.0
  4    heavy                   200.00       40.0         10.0


Irrn                          Application
Type   Name                      Code
----   ----                   -----------

  1    furrow                  2  (low)
  2    border dyke             2  (low)
  3    wheel roll              2  (low)
  4    center pivot 1          2  (low)
  5    center pivot 2          1  (high)
  6    trickle/drip            1  (high)
```

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Sector                              Matrix
  No.    Name                       Index
------   ----                       ------
   1     Agriculture                   1
   2     Forestry, etc.                2
   3     Metal Mines                   3
   4     Mineral Fuels                 4
   5     Non-Metal Mines               5
   6     Food & Beverages              6
   7     Tobacco                       7
   8     Rubber & Plastics             8
   9     Leather                       9
  10     Textiles                     10
  11     Wood                         11
  12     Furniture                    12
  13     Paper                        13
  14     Printing                     14
  15     Primary Metals- Iron         15
  16     Primary Metals-Other         16
  17     Metal Fabricating            17
  18     Machinery                    18
  19     Trans. Equipment             19
  20     Electric Products            20
  21     Non-Metal Minerals           21
  22     Petroleum & Coal             22
  23     Chemicals                    23
  24     Misc. Manufacture            24
  25     Construction                 25
  26     Transportation               26
  27     Electric Power               27
  28     Other Utilities              28
  29     Trade                        29
  30     Other                        30
```

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         General Data Base:  DATABASE.DAT                                   Date: TEST RUN 25/03/88     Page:  7

Sector                         WATER INTAKE  (MCM annually)
  No.    Name                  BC          Alberta     Sask        Manitoba    Ontario     Quebec      NB          PEI         NS          Nfld
------   ----                  --------    --------    --------    --------    --------    --------    --------    --------    --------    --------
   1     Agriculture              0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
   2     Forestry, etc.           0.000       0.019       0.017       0.022       0.000       0.000       0.000       0.000       0.000       0.000
   3     Metal Mines              0.000       0.000       0.858       1.152       0.000       0.000       0.000       0.000       0.000       0.000
   4     Mineral Fuels            0.000       8.348       0.017       0.507       0.000       0.000       0.000       0.000       0.000       0.000
   5     Non-Metal Mines          0.000       6.882      16.787       0.799       0.000       0.000       0.000       0.000       0.000       0.000
   6     Food & Beverages         0.000      18.601       4.341      14.293       0.000       0.000       0.000       0.000       0.000       0.000
   7     Tobacco                  0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
   8     Rubber & Plastics        0.000       0.442       0.036       0.138       0.000       0.000       0.000       0.000       0.000       0.000
   9     Leather                  0.000       0.081       0.004       0.280       0.000       0.000       0.000       0.000       0.000       0.000
  10     Textiles                 0.000       0.346       0.000       0.015       0.000       0.000       0.000       0.000       0.000       0.000
  11     Wood                     0.000       0.001       0.006       0.025       0.000       0.000       0.000       0.000       0.000       0.000
  12     Furniture                0.000       1.080       0.141       1.159       0.000       0.000       0.000       0.000       0.000       0.000
  13     Paper                    0.000       0.586      34.683      13.000     238.000       0.000       0.000       0.000       0.000       0.000
  14     Printing                 0.000       0.122       0.045       0.116       0.000       0.000       0.000       0.000       0.000       0.000
  15     Primary Metals- Iron     0.000       5.954      12.234       1.718       0.000       0.000       0.000       0.000       0.000       0.000
  16     Primary Metals-Other     0.000      33.149       5.879       5.553       0.000       0.000       0.000       0.000       0.000       0.000
  17     Metal Fabricating        0.000       0.196       0.012       0.279       0.000       0.000       0.000       0.000       0.000       0.000
  18     Machinery                0.000       3.072       1.294       4.485       0.000       0.000       0.000       0.000       0.000       0.000
  19     Trans. Equipment         0.000       0.558       0.003       0.060       0.000       0.000       0.000       0.000       0.000       0.000
  20     Electric Products        0.000       2.034       0.564       3.163       0.000       0.000       0.000       0.000       0.000       0.000
  21     Non-Metal Minerals       0.000       4.198       0.323       1.733       0.000       0.000       0.000       0.000       0.000       0.000
  22     Petroleum & Coal         0.000      16.021       1.506       1.149       0.000       0.000       0.000       0.000       0.000       0.000
  23     Chemicals                0.000     106.580       1.054       2.933       0.000       0.000       0.000       0.000       0.000       0.000
  24     Misc. Manufacture        0.000       0.801       0.217       0.788       0.000       0.000       0.000       0.000       0.000       0.000
  25     Construction             0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
  26     Transportation           0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
  27     Electric Power           0.000    1020.800     657.290      55.907       0.000       0.000       0.000       0.000       0.000       0.000
  28     Other Utilities          0.000     286.110      90.804     107.080       0.000       0.000       0.000       0.000       0.000       0.000
  29     Trade                    0.000      55.232      24.077      37.584       0.000       0.000       0.000       0.000       0.000       0.000
  30     Other                    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
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        General Data Base:  DATABASE.DAT                                   Date: TEST RUN 25/03/88     Page:  8

Sector                               CONSUMPTION  (%)
  No.    Name                        BC         Alberta    Sask       Manitoba   Ontario    Quebec     NB         PEI        NS         Nfld
------   ----                        --------   --------   --------   --------   --------   --------   --------   --------   --------   --------
   1     Agriculture                    0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
   2     Forestry, etc.                75.00      75.00      75.00      75.00      75.00      75.00      75.00      75.00      75.00      75.00
   3     Metal Mines                   13.20       0.00       0.00       0.00      13.20      13.20      13.20      13.20      13.20      13.20
   4     Mineral Fuels                 99.70      12.40       0.00      90.70      99.70      99.70      99.70      99.70      99.70      99.70
   5     Non-Metal Mines               13.10      10.87       1.64       0.00      13.10      13.10      13.10      13.10      13.10      13.10
   6     Food & Beverages              11.80      11.69      19.93       9.33      11.80      11.80      11.80      11.80      11.80      11.80
   7     Tobacco                       24.20      24.20      24.20      24.20      24.20      24.20      24.20      24.20      24.20      24.20
   8     Rubber & Plastics              8.30       7.86       0.08       1.25       8.30       8.30       8.30       8.30       8.30       8.30
   9     Leather                        0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
  10     Textiles                       0.00       0.00       0.00       0.05       0.00       0.00       0.00       0.00       0.00       0.00
  11     Wood                          13.40       0.00       9.56      96.60      13.40      13.40      13.40      13.40      13.40      13.40
  12     Furniture                      0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
  13     Paper                         11.10       5.52       0.20       0.44      11.10      11.10      11.10      11.10      11.10      11.10
  14     Printing                       2.90       2.90       2.90       2.90       2.90       2.90       2.90       2.90       2.90       2.90
  15     Primary Metals- Iron          17.90      48.23       6.80       8.60      17.90      17.90      17.90      17.90      17.90      17.90
  16     Primary Metals-Other           4.37       4.37       4.37       4.37       4.37       4.37       4.37       4.37       4.37       4.37
  17     Metal Fabricating              0.00       3.11       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
  18     Machinery                      3.40       3.40       3.40       3.40       3.40       3.40       3.40       3.40       3.40       3.40
  19     Trans. Equipment               4.90       6.32       0.80       4.20       4.90       4.90       4.90       4.90       4.90       4.90
  20     Electric Products              3.30       3.30       3.30       3.30       3.30       3.30       3.30       3.30       3.30       3.30
  21     Non-Metal Minerals            49.50      42.06      76.67      64.39      49.50      49.50      49.50      49.50      49.50      49.50
  22     Petroleum & Coal              42.20      42.69      60.97      28.70      42.20      42.20      42.20      42.20      42.20      42.20
  23     Chemicals                     30.90      30.89      74.82      67.00      47.00      30.90      30.90      30.90      30.90      30.90
  24     Misc. Manufacture              8.60       8.60       8.60       8.60       8.60       8.60       8.60       8.60       8.60       8.60
  25     Construction                   0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
  26     Transportation                 0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
  27     Electric Power                 3.80       3.41       3.67       0.14       3.80       3.80       3.80       3.80       3.80       3.80
  28     Other Utilities                0.00      15.00      15.00      15.00       0.00       0.00       0.00       0.00       0.00       0.00
  29     Trade                          0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
  30     Other                          0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
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          General Data Base:  DATABASE.DAT                                  Date: TEST RUN 25/03/88     Page:  9

Sector                        FINAL DEMAND  (Million $)
 No.    Name                  BC        Alberta   Sask      Manitoba  Ontario   Quebec    NB        PEI       NS        Nfld
------  ----                  --------  --------  --------  --------  --------  --------  --------  --------  --------  --------
   1    Agriculture                0.0    1780.1    1617.1     660.6       0.0       0.0       0.0       0.0       0.0       0.0
   2    Forestry, etc.             0.0      11.7      23.6      13.3       0.0       0.0       0.0       0.0       0.0       0.0
   3    Metal Mines                0.0       0.0     174.0     192.9       0.0       0.0       0.0       0.0       0.0       0.0
   4    Mineral Fuels              0.0    4945.0     193.9       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   5    Non-Metal Mines            0.0     927.1     496.9      15.9       0.0       0.0       0.0       0.0       0.0       0.0
   6    Food & Beverages           0.0    1722.5     414.9     812.7       0.0       0.0       0.0       0.0       0.0       0.0
   7    Tobacco                    0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   8    Rubber & Plastics          0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   9    Leather                    0.0      12.8       0.4      15.7       0.0       0.0       0.0       0.0       0.0       0.0
  10    Textiles                   0.0      36.6      11.9     162.1       0.0       0.0       0.0       0.0       0.0       0.0
  11    Wood                       0.0      40.7      15.2      16.8       0.0       0.0       0.0       0.0       0.0       0.0
  12    Furniture                  0.0      54.6       1.7      49.6       0.0       0.0       0.0       0.0       0.0       0.0
  13    Paper                      0.0      90.0      62.9      87.3       0.0       0.0       0.0       0.0       0.0       0.0
  14    Printing                   0.0     129.9      27.8      84.4       0.0       0.0       0.0       0.0       0.0       0.0
  15    Primary Metals- Iron       0.0       0.0      35.6     123.8       0.0       0.0       0.0       0.0       0.0       0.0
  16    Primary Metals-Other       0.0       0.0       0.0      21.7       0.0       0.0       0.0       0.0       0.0       0.0
  17    Metal Fabricating          0.0       0.0       0.0      41.3       0.0       0.0       0.0       0.0       0.0       0.0
  18    Machinery                  0.0       5.4      31.2     165.6       0.0       0.0       0.0       0.0       0.0       0.0
  19    Trans. Equipment           0.0      13.0      12.7     142.8       0.0       0.0       0.0       0.0       0.0       0.0
  20    Electric Products          0.0       0.0       0.0      31.4       0.0       0.0       0.0       0.0       0.0       0.0
  21    Non-Metal Minerals         0.0     208.3      37.2      68.7       0.0       0.0       0.0       0.0       0.0       0.0
  22    Petroleum & Coal           0.0     876.1      28.0      23.6       0.0       0.0       0.0       0.0       0.0       0.0
  23    Chemicals                  0.0     262.9       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
  24    Misc. Manufacture          0.0       0.0       3.4      14.2       0.0       0.0       0.0       0.0       0.0       0.0
  25    Construction               0.0    6386.2    1412.6     999.8       0.0       0.0       0.0       0.0       0.0       0.0
  26    Transportation             0.0    1898.8     532.8    1010.5       0.0       0.0       0.0       0.0       0.0       0.0
  27    Electric Power             0.0     329.9     132.1     228.2       0.0       0.0       0.0       0.0       0.0       0.0
  28    Other Utilities            0.0     109.7      38.0      39.2       0.0       0.0       0.0       0.0       0.0       0.0
  29    Trade                      0.0    1976.2     770.8     909.0       0.0       0.0       0.0       0.0       0.0       0.0
  30    Other                      0.0    7767.6    2029.0    2277.1       0.0       0.0       0.0       0.0       0.0       0.0
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          General Data Base:  DATABASE.DAT                                       Date: TEST RUN 25/03/88     Page: 10

Project                                                  Water Intake Coefficients  (MCM/yr/unit)
  No.     Name                    Units          BC             Alberta        Sask          Manitoba        Ontario         Quebec          NB              PEI             NS              Nfld
-------   ----                    -----      -----------    -----------    -----------    -----------    -----------    -----------    -----------    -----------    -----------    -----------
   1      Coal, Conventional      Mt/yr      0.320000E+00   0.320000E+00   0.320000E+00   0.320000E+00   0.320000E+00   0.320000E+00   0.320000E+00   0.320000E+00   0.320000E+00   0.320000E+00
   2      Coal, Hydraulic         Mt/yr      0.440000E+00   0.440000E+00   0.440000E+00   0.440000E+00   0.440000E+00   0.440000E+00   0.440000E+00   0.440000E+00   0.440000E+00   0.440000E+00
   3      Coal, Slurry            barrels/dy 0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00
   4      Coal, Liquefaction      Mt/yr      0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00
   5      Oil, Conventional       barrels/dy 0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00
   6      Oil, Heavy              barrels/dy 0.438000E-03   0.438000E-03   0.438000E-03   0.438000E-03   0.438000E-03   0.438000E-03   0.438000E-03   0.438000E-03   0.438000E-03   0.438000E-03
   7      Oil, Oil Sands          barrels/dy 0.256000E-03   0.256000E-03   0.256000E-03   0.256000E-03   0.256000E-03   0.256000E-03   0.256000E-03   0.256000E-03   0.256000E-03   0.256000E-03
   8      Oil, Refining           barrels/dy 0.400000E-04   0.400000E-04   0.400000E-04   0.400000E-04   0.400000E-04   0.400000E-04   0.400000E-04   0.400000E-04   0.400000E-04   0.400000E-04
   9      Uranium, mine (high)    tonnes/yr  0.250000E-03   0.250000E-03   0.250000E-03   0.250000E-03   0.250000E-03   0.250000E-03   0.250000E-03   0.250000E-03   0.250000E-03   0.250000E-03
  10      Uranium, mine (low)     tonnes/yr  0.750000E-03   0.750000E-03   0.750000E-03   0.750000E-03   0.750000E-03   0.750000E-03   0.750000E-03   0.750000E-03   0.750000E-03   0.750000E-03
  11      Uranium, refining       tonnes/yr  0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00
  12      Methanol, Coal          Mt/yr      0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00
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         General Data Base:  DATABASE.DAT                          Date: TEST RUN 25/03/88     Page: 11

Project                                          Consumption  (%)
  No.    Name                      BC       Alberta   Sask       Manitoba   Ontario    Quebec     NB         PEI        NS         Nfld
-------  ----                   --------   --------  --------   --------   --------   --------   --------   --------   --------   --------
   1     Coal, Conventional       25.00      25.00     25.00      25.00      25.00      25.00      25.00      25.00      25.00      25.00
   2     Coal, Hydraulic          45.00      45.00     45.00      45.00      45.00      45.00      45.00      45.00      45.00      45.00
   3     Coal, Slurry              0.00       0.00      0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
   4     Coal, Liquefaction        0.00       0.00      0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
   5     Oil, Conventional       100.00     100.00    100.00     100.00     100.00     100.00     100.00     100.00     100.00     100.00
   6     Oil, Heavy               90.00      90.00     90.00      90.00      90.00      90.00      90.00      90.00      90.00      90.00
   7     Oil, Oil Sands           90.00      90.00     90.00      90.00      90.00      90.00      90.00      90.00      90.00      90.00
   8     Oil, Refining            75.00      75.00     75.00      75.00      75.00      75.00      75.00      75.00      75.00      75.00
   9     Uranium, mine (high)     10.00      10.00     10.00      10.00      10.00      10.00      10.00      10.00      10.00      10.00
  10     Uranium, mine (low)      10.00      10.00     10.00      10.00      10.00      10.00      10.00      10.00      10.00      10.00
  11     Uranium, refining         0.00       0.00      0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
  12     Methanol, Coal            0.00       0.00      0.00       0.00       0.00       0.00       0.00       0.00       0.00       0.00
```

```
Project                                        Seasonal Distribution Factors  (% of intake)
  No.     Name                       Jan    Feb    Mar    Apr    May    Jun    Jul    Aug    Sep    Oct    Nov    Dec
--------  ----                       -----  -----  -----  -----  -----  -----  -----  -----  -----  -----  -----  -----
    1     Coal, Conventional         8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
    2     Coal, Hydraulic            8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
    3     Coal, Slurry               8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
    4     Coal, Liquefaction         8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
    5     Oil, Conventional          8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
    6     Oil, Heavy                 8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
    7     Oil, Oil Sands             8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
    8     Oil, Refining              8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
    9     Uranium, mine (high)       8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
   10     Uranium, mine (low)        8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
   11     Uranium, refining          8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
   12     Methanol, Coal             8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33   8.33
```

APPENDIX D2

SAMPLE OUTPUT

MODULE 2
List Forecast Data

```
file:  MODULE2.OUT


           Forecast File:  FORECAST.DAT                          Date: TEST RUN 25/03/88     Page:  1

    Number of Years: 25   (1982-2006)

    POPULATION SCENARIOS:   5
    -------------------------

    Population Scenario Number:       1
    Population Scenario Description:  Stats Canada 1

    Province        Region     Annual Change  (no. per 1,000)
    --------        ------     ------------------------------
                                1982     1983     1984     1985     1986     1987     1988     1989     1990     1991
                                1992     1993     1994     1995     1996     1997     1998     1999     2000     2001
                                2002     2003     2004     2005     2006

    B. C.           urban      20.60    20.80    14.60    13.50    12.60    11.50    10.60     9.90     9.20     8.50
                                7.70     7.00     6.40     5.70     5.00     4.60     4.20     3.90     3.50     3.20

                                3.00     2.70     2.50     2.30     2.10
                    rural      20.60    20.80    14.60    13.50    12.60    11.50    10.60     9.90     9.20     8.50
                                7.70     7.00     6.40     5.70     5.00     4.60     4.20     3.90     3.50     3.20

                                3.00     2.70     2.50     2.30     2.10

    Alberta         urban      43.00    42.90    -2.80    -1.80    -0.80     1.10     2.50     3.10     4.00     4.80
                                5.50     5.80     6.10     6.40     6.50     6.10     5.70     5.40     5.10     4.90

                                4.60     4.40     4.20     3.90     3.70
                    rural      43.00    42.90    -2.80    -1.80    -0.80     1.10     2.50     3.10     4.00     4.80
                                5.50     5.80     6.10     6.40     6.50     6.10     5.70     5.40     5.10     4.90

                                4.60     4.40     4.20     3.90     3.70

    Saskatchewan    urban       6.70     6.60    13.80    13.70    13.50    12.80    12.00    11.20    10.80    10.40
                                9.80     9.20     8.60     8.10     7.50     7.20     6.90     6.60     6.30     6.10

                                5.90     5.70     5.60     5.40     5.30
                    rural       6.70     6.60    13.80    13.70    13.50    12.80    12.00    11.20    10.80    10.40
                                9.80     9.20     8.60     8.10     7.50     7.20     6.90     6.60     6.30     6.10

                                5.90     5.70     5.60     5.40     5.30

    Manitoba        urban       7.80     7.90     8.80     9.50    10.30    10.10     9.80     8.30     7.20     5.90
                                4.80     3.60     2.50     1.50     0.50     0.10    -0.20    -0.40    -0.70    -0.90

                               -1.10    -1.30    -1.40    -1.60    -1.70
                    rural       7.80     7.90     8.80     9.50    10.30    10.10     9.80     8.30     7.20     5.90
                                4.80     3.60     2.50     1.50     0.50     0.10    -0.20    -0.40    -0.70    -0.90

                               -1.10    -1.30    -1.40    -1.60    -1.70
```

```
      Forecast File:  FORECAST.DAT                                      Date: TEST RUN 25/03/88     Page:  2

Population Scenario Number:        2
Population Scenario Description:  Stats Canada 2

Province             Region     Annual Change  (no. per 1,000)
--------             ------     ------------------------------
                                  1982     1983     1984     1985     1986     1987     1988     1989     1990     1991
                                  1992     1993     1994     1995     1996     1997     1998     1999     2000     2001
                                  2002     2003     2004     2005     2006

B. C.                urban       20.60    20.80    14.60    15.00    15.50    15.30    16.00    17.40    17.40    17.90
                                 17.10    16.30    15.20    13.90    12.80    12.30    11.90    11.40    11.00    10.60

                                 10.20     9.90     9.60     9.30     9.10
                     rural       20.60    20.80    14.60    15.00    15.50    15.30    16.00    17.40    17.40    17.90
                                 17.10    16.30    15.20    13.90    12.80    12.30    11.90    11.40    11.00    10.60

                                 10.20     9.90     9.60     9.30     9.10

Alberta              urban       43.00    42.90     4.00     8.20    10.70    14.00    17.90    20.20    19.90    18.60
                                 17.70    16.50    15.70    14.70    13.80    13.10    12.50    11.90    11.40    10.80

                                 10.40     9.90     9.50     9.10     8.70
                     rural       43.00    42.90     4.00     8.20    10.70    14.00    17.90    20.20    19.90    18.60
                                 17.70    16.50    15.70    14.70    13.80    13.10    12.50    11.90    11.40    10.80

                                 10.40     9.90     9.50     9.10     8.70

Saskatchewan         urban        6.70     6.60    12.80    11.20    10.20     8.70     7.50     7.10     6.70     6.20
                                  5.80     5.50     5.30     5.50     5.20     5.00     4.80     4.60     4.50     4.30

                                  4.20     4.10     4.00     3.90     3.90
                     rural        6.70     6.60    12.80    11.20    10.20     8.70     7.50     7.10     6.70     6.20
                                  5.80     5.50     5.30     5.50     5.20     5.00     4.80     4.60     4.50     4.30

                                  4.20     4.10     4.00     3.90     3.90

Manitoba             urban        7.80     7.90     8.20     8.00     7.40     6.40     5.50     4.20     3.30     1.80
                                  1.10     0.70     0.50     0.60     0.40     0.10    -0.10    -0.30    -0.50    -0.60

                                 -0.80    -0.90    -1.00    -1.00    -1.10
                     rural        7.80     7.90     8.20     8.00     7.40     6.40     5.50     4.20     3.30     1.80
                                  1.10     0.70     0.50     0.60     0.40     0.10    -0.10    -0.30    -0.50    -0.60

                                 -0.80    -0.90    -1.00    -1.00    -1.10
```

```
          Forecast File:  FORECAST.DAT                                          Date: TEST RUN 25/03/88     Page:  3

Population Scenario Number:        3
Population Scenario Description:  Stats Canada 3

Province            Region      Annual Change  (no. per 1,000)
--------            ------      ------------------------------
                                 1982      1983      1984      1985      1986      1987      1988      1989      1990      1991
                                 1992      1993      1994      1995      1996      1997      1998      1999      2000      2001
                                 2002      2003      2004      2005      2006

B. C.               urban        20.60     20.80     14.70     15.20     16.00     16.00     16.80     18.40     18.60     19.30
                                 18.60     18.00     17.00     15.90     14.80     14.40     13.90     13.40     13.00     12.60

                                 12.20     11.90     11.60     11.30     11.10
                    rural        20.60     20.80     14.70     15.20     16.00     16.00     16.80     18.40     18.60     19.30
                                 18.60     18.00     17.00     15.90     14.80     14.40     13.90     13.40     13.00     12.60

                                 12.20     11.90     11.60     11.30     11.10

Alberta             urban        43.00     42.90      4.10      8.70     11.60     15.20     19.30     21.90     21.90     20.80
                                 20.10     19.10     18.40     17.50     16.80     16.10     15.40     14.70     14.10     13.50

                                 13.00     12.50     12.10     11.70     11.30
                    rural        43.00     42.90      4.10      8.70     11.60     15.20     19.30     21.90     21.90     20.80
                                 20.10     19.10     18.40     17.50     16.80     16.10     15.40     14.70     14.10     13.50

                                 13.00     12.50     12.10     11.70     11.30

Saskatchewan        urban         6.70      6.60     13.00     11.70     11.10     10.00      9.10      9.00      8.90      8.70
                                  8.50      8.50      8.40      8.90      8.70      8.50      8.30      8.00      7.80      7.60

                                  7.50      7.30      7.20      7.20      7.10
                    rural         6.70      6.60     13.00     11.70     11.10     10.00      9.10      9.00      8.90      8.70
                                  8.50      8.50      8.40      8.90      8.70      8.50      8.30      8.00      7.80      7.60

                                  7.50      7.30      7.20      7.20      7.10

Manitoba            urban         7.80      7.90      8.40      8.40      8.10      7.40      6.70      5.60      4.90      3.70
                                  3.10      2.90      2.80      3.00      3.00      2.80      2.50      2.30      2.10      1.90

                                  1.70      1.60      1.50      1.40      1.40
                    rural         7.80      7.90      8.40      8.40      8.10      7.40      6.70      5.60      4.90      3.70
                                  3.10      2.90      2.80      3.00      3.00      2.80      2.50      2.30      2.10      1.90

                                  1.70      1.60      1.50      1.40      1.40
```

```
        Forecast File:  FORECAST.DAT                                           Date: TEST RUN 25/03/88     Page:  4

Population Scenario Number:        4
Population Scenario Description:  Stats Canada 4

Province          Region       Annual Change  (no. per 1,000)
--------          ------       ------------------------------
                                1982      1983      1984      1985      1986      1987      1988      1989      1990      1991
                                1992      1993      1994      1995      1996      1997      1998      1999      2000      2001
                                2002      2003      2004      2005      2006

B. C.             urban        20.60     20.80     15.00     14.10     13.40     12.70     12.20     11.90     11.60     11.30
                               10.90     10.60     10.30     10.00      9.40      9.00      8.60      8.30      7.90      7.60

                                7.40      7.10      6.90      6.80      6.60
                  rural        20.60     20.80     15.00     14.10     13.40     12.70     12.20     11.90     11.60     11.30
                               10.90     10.60     10.30     10.00      9.40      9.00      8.60      8.30      7.90      7.60

                                7.40      7.10      6.90      6.80      6.60

Alberta           urban        43.00     42.90     -2.40     -1.00      0.30      2.70      4.50      5.60      7.00      8.10
                                9.20      9.80     10.50     11.10     11.30     11.00     10.60     10.20      9.80      9.50

                                9.20      9.00      8.80      8.50      8.30
                  rural        43.00     42.90     -2.40     -1.00      0.30      2.70      4.50      5.60      7.00      8.10
                                9.20      9.80     10.50     11.10     11.30     11.00     10.60     10.20      9.80      9.50

                                9.20      9.00      8.80      8.50      8.30

Saskatchewan      urban         6.70      6.60     14.10     14.30     14.60     14.30     14.00     13.60     13.60     13.50
                               13.30     13.10     12.80     12.60     12.20     11.90     11.50     11.20     10.90     10.60

                               10.40     10.20     10.00      9.90      9.80
                  rural         6.70      6.60     14.10     14.30     14.60     14.30     14.00     13.60     13.60     13.50
                               13.30     13.10     12.80     12.60     12.20     11.90     11.50     11.20     10.90     10.60

                               10.40     10.20     10.00      9.90      9.80

Manitoba          urban         7.80      7.90      9.10     10.20     11.30     11.50     11.60     10.60      9.80      9.00
                                8.20      7.50      6.70      6.00      5.20      4.90      4.60      4.30      4.00      3.70

                                3.50      3.30      3.20      3.00      2.90
                  rural         7.80      7.90      9.10     10.20     11.30     11.50     11.60     10.60      9.80      9.00
                                8.20      7.50      6.70      6.00      5.20      4.90      4.60      4.30      4.00      3.70

                                3.50      3.30      3.20      3.00      2.90
```

```
          Forecast File:  FORECAST.DAT                                       Date: TEST RUN 25/03/88     Page:  5

Population Scenario Number:          5
Population Scenario Description:  Stats Canada 5

Province           Region      Annual Change  (no. per 1,000)
--------           ------      ------------------------------
                                1982     1983     1984     1985     1986     1987     1988     1989     1990     1991
                                1992     1993     1994     1995     1996     1997     1998     1999     2000     2001
                                2002     2003     2004     2005     2006

B. C.              urban       20.60    20.80    12.80    12.80    12.90    13.20    13.40    13.70    14.00    14.20
                               14.40    14.50    14.60    14.60    14.50    14.20    13.70    13.30    12.80    12.50

                               12.10    11.90    11.60    11.40    11.20
                   rural       20.60    20.80    12.80    12.80    12.90    13.20    13.40    13.70    14.00    14.20
                               14.40    14.50    14.60    14.60    14.50    14.20    13.70    13.30    12.80    12.50

                               12.10    11.90    11.60    11.40    11.20

Alberta            urban       43.90    42.90    22.00    21.30    20.60    19.90    19.30    19.10    18.90    18.70
                               18.40    18.20    17.90    17.60    17.20    16.80    16.10    15.50    15.00    14.50

                               14.00    13.60    13.20    12.90    12.60
                   rural       43.90    42.90    22.00    21.30    20.60    19.90    19.30    19.10    18.90    18.70
                               18.40    18.20    17.90    17.60    17.20    16.80    16.10    15.50    15.00    14.50

                               14.00    13.60    13.20    12.90    12.60

Saskatchewan       urban        6.70     6.60    11.80    12.10    12.30    12.50    12.70    12.90    13.10    13.20
                               13.20    13.30    13.20    13.20    13.00    12.90    12.50    12.20    11.90    11.60

                               11.40    11.20    11.10    11.00    10.90
                   rural        6.70     6.60    11.80    12.10    12.30    12.50    12.70    12.90    13.10    13.20
                               13.20    13.30    13.20    13.20    13.00    12.90    12.50    12.20    11.90    11.60

                               11.40    11.20    11.10    11.00    10.90

Manitoba           urban        7.80     7.90     8.20     8.60     9.10     9.60    10.10    10.60    10.90    11.20
                               11.50    11.80    12.00    12.20    12.20    12.10    11.60    11.20    10.90    10.50

                               10.20    10.00     9.80     9.60     9.50
                   rural        7.80     7.90     8.20     8.60     9.10     9.60    10.10    10.60    10.90    11.20
                               11.50    11.80    12.00    12.20    12.20    12.10    11.60    11.20    10.90    10.50

                               10.20    10.00     9.80     9.60     9.50
```

```
LIVESTOCK SCENARIOS:   3
------------------------

No.  Description     Province        Annual % Change
---  -----------     --------        ---------------
                                     beef ca   dairy c   horses    pigs      sheep     poultry
 1   low
                     B. C.            0.65     -0.48      0.07    -2.99     -1.97      0.34
                     Alberta          1.02     -1.67     -1.07    -1.45     -2.05     -1.21
                     Saskatchewan     0.91     -1.71     -0.78    -0.98     -2.41     -1.63
                     Manitoba         0.10     -2.67     -0.92     0.28     -1.85     -0.68
 2   expected
                     B. C.            1.55      0.32      1.20    -2.27     -0.50      1.15
                     Alberta          1.92      0.00      0.08    -0.40     -0.83      0.60
                     Saskatchewan     1.82     -0.51     -0.40     0.22     -1.00     -0.59
                     Manitoba         1.06     -0.57     -0.21     1.72     -0.78      0.00
 3   high
                     B. C.            2.44      0.83      2.13     1.59      0.89      1.68
                     Alberta          2.84      1.56      0.49     1.45      1.10      0.33
                     Saskatchewan     2.73      0.87      0.40     2.55      0.00      0.63
                     Manitoba         2.56      2.08      0.53     3.23      0.21      0.97



INDUSTRIAL SCENARIOS:   1
-------------------------
```

```
                    Forecast File:  FORECAST.DAT                                          Date: TEST RUN 25/03/88     Page:  7


Industrial Scenario Number:        1
Industrial Scenario Description:   Informetrica Limited                                   No Cascading
                                   (without regional effects)

No.    Description             Annual Percentage Change  (1981-1986)
---    -----------             -------------------------------------
                               BC           Alberta    Sask       Manitoba  Ontario   Quebec    NB         PEI        NS         Nfld
  1    Agriculture               1.10         2.00       7.40       7.10     -1.10      1.60      0.50       0.30       3.90       6.70
  2    Forestry, etc.           -1.20         5.70      16.50       2.60      2.90      3.90      8.00       5.30       0.00       1.20
  3    Metal Mines               1.80         0.00      12.90      -0.30     -1.80     -5.00      0.90     278.50       0.00      -5.50
  4    Mineral Fuels             0.40        -0.90       3.80       6.50      5.70      0.00    -12.80      11.90       0.00      23.10
  5    Non-Metal Mines          -0.80        14.40      -0.20       7.50      1.70     -9.30     14.60       5.90      -7.80      -4.70
  6    Food & Beverages          3.80         0.70       1.20       1.40      1.20     -1.50      3.30      -0.40      -3.70       9.60
  7    Tobacco                   0.00         0.00       0.00       0.00     -2.70     -3.10      0.00       0.00       0.00       0.00
  8    Rubber & Plastics         6.30        -1.00       5.60       5.40      3.20      6.30     22.30       4.10       3.30       0.00
  9    Leather                  -0.40         0.50      15.20      -3.40      0.10     -1.70      8.70       1.80       0.90      14.60
 10    Textiles                  8.00        -1.70       4.90      11.60      3.40     -1.60      2.80       1.00      -9.60       3.60
 11    Wood                     -0.70         0.00       3.90      -0.40      5.30      2.20      1.90      -0.40      -0.70       2.30
 12    Furniture                 2.00        -5.50       2.80      -1.50      2.90      0.80    -10.00       7.20       0.00       3.80
 13    Paper                    -1.30         2.00     -11.10      -0.90      3.20      3.10     -2.30      -0.40       0.00      -5.10
 14    Printing                  0.90         2.80       0.10       1.50      3.40      3.30     -0.50       3.00       5.20       2.80
 15    Primary Metals- Iron     -6.00        -3.70      -1.60      -0.30      0.30      2.80     10.60      -6.60       0.00       0.00
 16    Primary Metals-Other     -6.00        -3.70      -1.60      -0.30      0.30      2.80     10.60      -6.60       0.00       0.00
 17    Metal Fabricating        -4.00        -5.40      -1.50      -6.30     -0.50     -2.50      3.00      -1.40      10.70      -7.90
 18    Machinery                -6.80         0.40      -1.40      -7.50      0.30     -2.90     -1.20      -9.70      13.10       5.00
 19    Trans. Equipment        -11.70         2.00      16.30       9.80      7.30     -3.00      6.10     -11.40     -21.50     -17.70
 20    Electric Products        -2.60         6.00      -1.20      -3.70      1.40      1.20    -14.50       2.00       1.70      10.40
 21    Non-Metal Minerals       -4.20        -8.40      -7.30      -0.70      3.20      2.80      0.70       1.00       8.20      -0.10
 22    Petroleum & Coal          4.00         5.20      -9.90       0.00     -0.30    -11.10    -12.20      -4.30       0.00       0.00
 23    Chemicals                -0.30         2.30       3.40      -2.50      2.10      2.30      1.50     -13.10      17.70     -11.30
 24    Misc. Manufacture         3.80         0.60      -4.90       2.10     -3.40      2.90    -13.20       5.70      60.20       1.50
 25    Construction             -4.60        -8.00      -3.10       4.30      3.70      2.10     -1.50       2.80       0.80       2.60
 26    Transportation            2.80        -0.10       2.90       3.30      3.20      0.00      5.10       3.70       0.00       1.40
 27    Electric Power            2.90         5.30       3.20       2.90      3.10      4.10      6.90       2.30       2.90       3.00
 28    Other Utilities           2.90         5.30       3.20       2.90      3.10      4.10      6.90       2.30       2.90       3.00
 29    Trade                     1.70         1.80       2.30       4.50      4.80      3.30      0.80       4.30       1.90       2.90
 30    Other                     2.60         2.30       3.30       1.40      3.80      2.60      2.80       2.00       2.10       1.50
```

```
          Forecast File:  FORECAST.DAT                                            Date: TEST RUN 25/03/88     Page:  8

     Industrial Scenario Number:        1
     Industrial Scenario Description:   Informetrics Limited                       No Cascading
                                        (without regional effects)

     No.   Description            Annual Percentage Change  (1987-1991)
     ---   -----------            -------------------------------------
                                  BC        Alberta   Sask      Manitoba  Ontario   Quebec    NB        PEI       NS        Nfld
       1   Agriculture              2.70      1.10      0.90      1.10      2.30      2.60      1.70      1.50      1.50      1.80
       2   Forestry, etc.           2.10      3.50      3.50      3.50      3.50      3.50      3.00      2.50      3.00      3.00
       3   Metal Mines              3.60      3.40      2.70      3.40      3.00      1.20      5.00      5.4C      0.00      0.20
       4   Mineral Fuels            8.00      1.30      2.70      2.80      1.90      0.00      1.90    -22.50      0.00     -1.20
       5   Non-Metal Mines          3.40      5.60      4.20      7.60     -1.10      8.40     14.50    -12.20     -9.60      6.30
       6   Food & Beverages         2.00      4.00      2.60      0.90      2.40      2.70      1.50      1.70      2.40      1.00
       7   Tobacco                  0.00      0.00      0.00      0.00     -1.00     -0.60      0.00      0.00      0.00      0.00
       8   Rubber & Plastics        3.30      3.30      3.30      3.30      3.90      3.30      3.30      3.30      3.30      3.30
       9   Leather                  0.90      0.90      0.90      0.90      0.30      1.90      0.90      0.90      0.90      0.90
      10   Textiles                 3.20      3.20      3.20      2.50      3.40      3.40      3.20      3.20      3.20      3.20
      11   Wood                     2.00      0.40      1.70      1.10      0.70      1.40      2.50      1.20      1.30      1.40
      12   Furniture                0.40      2.80      3.30      2.80      3.20      3.70      3.60      3.60      0.00      3.70
      13   Paper                    3.10      3.70      4.10      3.20      2.50      3.10      2.50      1.70      0.00      2.50
      14   Printing                 2.40      1.40      2.40      2.50      2.60      2.40      2.70      2.40      2.40      2.40
      15   Primary Metals- Iron    -0.40      5.00      3.80      3.80      3.60      5.30      3.80      3.80      0.00      0.00
      16   Primary Metals-Other    -0.40      5.00      3.80      3.80      3.60      5.30      3.80      3.80      0.00      0.00
      17   Metal Fabricating        5.60      3.10      4.30      5.10      3.60      4.80      4.40      3.30      3.50      2.40
      18   Machinery                3.60      4.40      1.90     -3.60      5.20      5.40      5.10      6.00      5.10      6.00
      19   Trans. Equipment         3.30      2.90      2.50      3.70      3.30      5.20     12.80      9.40      0.30      5.00
      20   Electric Products        2.40      4.00      4.00      4.00      4.20      3.90      4.90      4.90      4.90      4.90
      21   Non-Metal Minerals       1.00      5.10      4.00      4.30      4.20      5.10      4.50      4.20      4.50      4.50
      22   Petroleum & Coal         1.80      0.80      3.90      0.00      4.60      3.60      4.10      3.60      0.00      0.00
      23   Chemicals                1.20      3.20      2.50      1.10      1.90      1.70      1.30      1.30      1.30      1.30
      24   Misc. Manufacture        3.50      3.20      3.70      3.60      3.60      3.70      3.70      3.80      4.10      3.70
      25   Construction            -0.40      4.10      3.70      3.00      1.90      4.10      2.80     -1.00     -3.90      4.00
      26   Transportation           1.60      2.10      2.50      2.10      2.60      2.40      2.40      1.40      0.80      1.50
      27   Electric Power           2.10      2.00      2.60      5.10      2.70      3.40      3.00      2.90      3.20      2.70
      28   Other Utilities          2.10      2.00      2.60      5.10      2.70      3.40      3.00      2.90      3.20      2.70
      29   Trade                    1.90      1.30      2.40      1.80      3.20      2.90      2.10      2.30      2.70      2.70
      30   Other                    1.40      2.00      2.10      1.90      2.80      2.50      2.30      2.50      2.10      2.10
```

```
        Forecast File:  FORECAST.DAT                                        Date: TEST RUN 25/03/88     Page:  9

Industrial Scenario Number:         1
Industrial Scenario Description:    Informetrica Limited                                 No Cascading
                                    (without regional effects)

No.   Description           Annual Percentage Change  (1992-1996)
---   -----------           -------------------------------------
                            BC        Alberta   Sask      Manitoba  Ontario   Quebec    NB        PEI       NS        Nfld
  1   Agriculture             2.30      2.40      2.40      2.40      2.30      2.30      1.10      0.60      1.20      0.50
  2   Forestry, etc.          1.70      2.40      2.40      2.40      2.40      2.40      1.90     -0.40      1.90      1.90
  3   Metal Mines             2.80      2.30      2.10      2.00      2.10      2.70      2.90      2.30      0.00      2.20
  4   Mineral Fuels           3.50      2.60      0.50      2.30      2.10      0.00      2.10    -25.30      0.00    147.50
  5   Non-Metal Mines         3.10      2.60      3.50      2.70      2.40      0.70      5.20     -3.20      1.10      2.80
  6   Food & Beverages        2.20      2.20      2.20      2.20      2.20      2.20      2.50      2.40      2.20      1.90
  7   Tobacco                 0.00      0.00      0.00      0.00      1.10      1.10      0.00      0.00      0.00      0.00
  8   Rubber & Plastics       2.70      2.70      2.70      2.70      2.70      2.70      2.70      2.70      2.70      2.70
  9   Leather                 2.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10
 10   Textiles                2.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10
 11   Wood                    2.00      1.70      1.70      1.70      1.70      1.70      1.80      1.70      1.70      1.70
 12   Furniture               2.70      2.70      2.70      2.70      2.70      2.70      2.70      2.70      0.00      2.70
 13   Paper                   2.70      2.50      2.60      2.50      2.50      2.60      1.90      1.50      0.00      1.40
 14   Printing                2.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10
 15   Primary Metals- Iron    2.00      3.50      2.60      2.60      2.50      2.70      2.60      2.60      0.00      0.00
 16   Primary Metals-Other    2.00      3.50      2.60      2.60      2.50      2.70      2.60      2.60      0.00      0.00
 17   Metal Fabricating       2.80      4.70      2.80      3.40      2.90      2.50      2.60      2.30      2.70      3.30
 18   Machinery               2.60      5.50      2.60      3.40      2.60      2.60      2.60      2.60      2.60      2.60
 19   Trans. Equipment        4.30      5.80      6.50      5.40      3.70      2.90    -12.40      4.80      3.10     14.10
 20   Electric Products       3.10      3.10      3.10      3.10      3.10      3.10      3.10      3.10      3.10      3.10
 21   Non-Metal Minerals      2.70      5.00      4.10      4.60      3.20      1.50      3.60      3.60      3.60      3.60
 22   Petroleum & Coal        1.50      2.70      2.10      0.00      2.20     -0.30      1.60      1.60      0.00     -0.30
 23   Chemicals               2.10      4.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10      2.10
 24   Misc. Manufacture       2.50      2.50      2.50      2.50      2.50      2.50      2.50      2.50      2.50      2.50
 25   Construction            2.30      5.40      4.10      5.30      2.30      1.50      0.20      0.40      1.80      6.20
 26   Transportation          2.60      3.00      2.80      2.50      2.60      2.40      2.30      2.30      2.30      4.20
 27   Electric Power          1.60      1.20      1.60      3.10      1.80      2.90      2.00      1.10      1.50      1.60
 28   Other Utilities         1.60      1.20      1.60      3.10      1.80      2.90      2.00      1.10      1.50      1.60
 29   Trade                   1.70      2.70      2.10      1.60      2.10      1.90      1.20      1.60      1.50      3.60
 30   Other                   1.30      2.50      2.30      1.40      2.20      1.90      1.10      1.80      1.70      3.00
```

```
        Forecast File:  FORECAST.DAT                                     Date: TEST RUN 25/03/88     Page: 10

  Industrial Scenario Number:        1
  Industrial Scenario Description:   Informetrics Limited                              No Cascading
                                     (without regional effects)

  No.   Description             Annual Percentage Change  (1997-2099)
  ---   -----------             -------------------------------------
                                BC       Alberta   Sask     Manitoba  Ontario  Quebec   NB       PEI      NS       Nfld
    1   Agriculture              2.30     2.30      2.40     2.40      2.30     2.30     1.10     0.50     1.20     0.50
    2   Forestry, etc.           2.20     1.60      1.80     1.60      1.60     1.60     0.30     0.00     1.10     0.60
    3   Metal Mines              1.70     1.10      0.80     0.30      0.60     1.60     1.30     1.10     0.00     1.30
    4   Mineral Fuels            6.80     0.60     -1.10     0.60      0.20     0.00     0.20    -2.40     0.00    -0.10
    5   Non-Metal Mines          0.70     2.80      3.60    -2.80      2.50     2.30     2.20     2.20    -0.70    -0.70
    6   Food & Beverages         2.00     2.00      2.00     2.00      2.00     2.00     2.00     2.80     2.00     2.30
    7   Tobacco                  0.00     0.00      0.00     0.00      2.90     2.90     0.00     0.00     0.00     0.00
    8   Rubber & Plastics        2.20     2.20      2.20     2.20      2.20     2.20     2.20     2.20     2.20     2.20
    9   Leather                  2.40     2.40      2.40     2.40      2.40     2.40     2.40     2.40     2.40     2.40
   10   Textiles                 1.10     1.10      1.10     1.10      1.10     1.10     1.10     1.10     1.10     1.10
   11   Wood                     2.40     2.20      2.20     2.20      2.20     2.20     0.20     2.20     2.20     2.20
   12   Furniture                2.40     2.40      2.40     2.40      2.40     2.40     2.40     2.40     0.00     2.40
   13   Paper                    2.00     1.90      2.00     1.90      1.90     2.00     1.40     1.10     0.00     1.10
   14   Printing                 1.60     1.60      1.60     1.60      1.60     1.60     1.60     1.60     1.60     1.80
   15   Primary Metals- Iron     1.70     3.60      2.50     2.50      2.70     2.30     2.50     2.50     0.00     0.00
   16   Primary Metals-Other     1.70     3.60      2.50     2.50      2.70     2.30     2.50     2.50     0.00     0.00
   17   Metal Fabricating        2.20     3.80      2.50     2.50      2.30     2.00     2.00     1.90     2.00     1.60
   18   Machinery                1.40     4.90      1.40     4.10      1.40     1.40     1.40     1.40     1.40     1.40
   19   Trans. Equipment         2.00     2.10      1.90     2.50      3.70     2.60     1.50     2.10     0.30    -3.40
   20   Electric Products        1.60     1.60      1.60     1.60      1.60     1.60     1.60     1.60     1.80     1.60
   21   Non-Metal Minerals       1.40     3.50      4.50     3.40      2.60     2.00     2.80     2.80     2.80     2.80
   22   Petroleum & Coal         1.40     2.30      2.40     0.00      1.90    -0.10     1.70     1.90     0.00    -0.10
   23   Chemicals                1.60     4.00      1.60     1.60      1.60     1.60     1.60     1.60     1.60     1.60
   24   Misc. Manufacture        1.70     1.70      1.70     1.70      1.70     1.70     1.70     1.70     1.70     1.70
   25   Construction             2.00     4.00      5.10     4.60      2.60     1.90     3.00     1.50     1.60     0.40
   26   Transportation           2.00     2.10      2.30     1.90      2.00     1.80     2.10     1.90     1.60     1.40
   27   Electric Power           1.40     0.90      1.80     3.10      1.80     1.80     1.80     1.40     1.10     1.30
   28   Other Utilities          1.40     0.90      1.80     3.10      1.80     1.80     1.80     1.40     1.10     1.30
   29   Trade                    1.60     2.10      2.20     1.50      1.80     1.50     1.50     1.60     1.40     1.10
   30   Other                    1.30     2.10      2.30     1.50      1.50     1.30     1.40     1.60     1.70     1.20
```

APPENDIX D3

SAMPLE OUTPUT

MODULE 3
List Gauge Data

```
file:  MODULE3.OUT


              Gauge Detail File                                           Date: TEST RUN 25/03/88     Page:  1


     Node No.:      1                     Node I.D.:    RSRVR01
     --------                             ---------
     Node Name:   Reservoir No. 1
     ---------
     Province:      2,  Alberta           Region:       Alberta
     --------                             ------


     Cutback Increments
     ------------------
     domestic      0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
     livestock     0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
     industrial    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
     irrigation    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100

     Groundwater Limit:    none
     -----------------


       Population  Usage            Intake    Consumption                  Seasonal Distribution Factors / Groundwater Fractions
     ------------- -----         ------------ -----------    -----------------------------------------------------------------------------------------
                                   l/day/capita      %             Jan     Feb     Mar     Apr     May     Jun     Jul     Aug     Sep     Oct     Nov     Dec

     Urban:       0
                   non-industrial     483.0        20.00           0.7     0.7     0.7     1.0     1.3     1.3     1.3     1.3     1.3     1.0     0.7     0.7
                                                                 0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000

     Rural:       0
                   general            137.0        70.00           0.7     0.7     0.7     1.0     1.3     1.3     1.3     1.3     1.3     1.0     0.7     0.7
                                                                 0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000


     Livestock Data
     -------------
     Animal Type        Number    Intake     Consumption                   Groundwater Fractions (same for all livestock types)
     -----------        ------  ----------   -----------    ---------------------------------------------------------------------------------------
                        x1,000  l/day/head        %           Jan     Feb     Mar     Apr     May     Jun     Jul     Aug     Sep     Oct     Nov     Dec
     beef cattle          0        20.4        90.00
     dairy cattle         0        54.0        70.00
     horses               0        68.0        70.00
     pigs                 0         6.0        70.00
     sheep                0         3.5        95.00
     poultry              0         0.3        95.00
                                                            0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
```

```
Industrial Data
---------------

                           Intake    Consumption              Groundwater Fractions (decimal fraction of demanded intake)
Industry                  MCM/year   Percentage     Jan    Feb    Mar    Apr    May    Jun    Jul    Aug    Sep    Oct    Nov    Dec
--------                  ---------  -----------  -----------------------------------------------------------------------------------
Agriculture                 0.000        0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Forestry, etc.              0.000       75.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Metal Mines                 0.000        0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Mineral Fuels               0.000       12.4      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Non-Metal Mines             0.000       10.9      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Food & Beverages            0.000       11.7      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Tobacco                     0.000       24.2      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Rubber & Plastics           0.000        7.9      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Leather                     0.000        0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Textiles                    0.000        0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Wood                        0.000        0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Furniture                   0.000        0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Paper                       0.000        5.5      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Printing                    0.000        2.9      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Primary Metals- Iron        0.000       48.2      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Primary Metals-Other        0.000        4.4      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Metal Fabricating           0.000        3.1      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Machinery                   0.000        3.4      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Trans. Equipment            0.000        6.3      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Electric Products           0.000        3.3      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Non-Metal Minerals          0.000       42.1      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Petroleum & Coal            0.000       42.7      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Chemicals                   0.000       30.9      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Misc. Manufacture           0.000        8.6      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Construction                0.000        0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Transportation              0.000        0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Electric Power              0.000        3.4      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Other Utilities             0.000       15.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Trade                       0.000        0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Other                       0.000        0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
```

```
         Gauge Detail File                                          Date: TEST RUN 25/03/88     Page:  3

Reservoir Data
--------------

Name:                    Reservoir No. 1


                                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
                            ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
Full Supply      Level  (m) :   951.00
Evaluation       Level  (m) :   949.50     949.50     949.50     949.50     949.50     949.50     949.50     949.50     949.50     949.50     949.50     949.50
Upper Rule Curve Level  (m) :   948.00     948.00     948.00     948.00     948.00     948.00     948.00     948.00     948.00     948.00     948.00     948.00
Evaluation       Level  (m) :   944.00     941.50     939.00     939.00     941.50     944.00     946.50     946.50     946.50     946.50     946.50     946.50
Lower Rule Curve Level  (m) :   940.00     935.00     930.00     930.00     935.00     940.00     945.00     945.00     945.00     945.00     945.00     945.00
Evaluation       Level  (m) :   933.00     930.50     928.00     928.00     930.50     933.00     935.50     935.50     935.50     935.50     935.50     935.50
Minimum Supply   Level  (m) :   926.00
Maximum    Release     (cms):   500.00     500.00     500.00     500.00     500.00     500.00     500.00     500.00     500.00     500.00     500.00     500.00
Evaluation Release     (cms):   258.00     258.00     258.00     258.00     258.00     258.00     258.00     258.00     258.00     258.00     258.00     258.00
Target     Flow        (cms):    16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00
Evaluation Release     (cms):    16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00
Minimum    Release     (cms):    16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00      16.00


                                  1          2          3          4          5          6          7
Stage (m):                      924.00     929.00     934.00     939.00     944.00     948.00     951.00
Volume (MCM):                    10.00      25.00      52.00      90.00     145.00     210.00     280.00
Surface Area (sq. km):            2.70       4.30       6.50       9.60      13.20      17.70      19.20


No. of Development Scenarios =  1
```

```
Scenario Number:    1

Development Year:   1987

Description:        1987 - Test Case Scneario


 0 Diversions


 0 Minimum Flow Requirements


 0 Energy Projects
```

```
         Gauge Detail File                                          Date: TEST RUN 25/03/88     Page:  1


Node No.:      2                         Node I.D.:   NODE_02
--------                                 ---------
Node Name:   Node 2
---------
Province:      2,  Alberta               Region:      Alberta
--------                                 ------


Cutback Increments
------------------
domestic      0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
livestock     0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
industrial    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100
irrigation    0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100

Groundwater Limit:    none
-----------------


  Population   Usage            Intake   Consumption                     Seasonal Distribution Factors / Groundwater Fractions
  ----------   -----        ------------ -----------     -----------------------------------------------------------------------------------------
                            l/day/capita      %            Jan    Feb    Mar    Apr    May    Jun    Jul    Aug    Sep    Oct    Nov    Dec

Urban:   68242
               non-industrial    426.0      20.00          0.7    0.7    0.7    1.0    1.3    1.3    1.3    1.3    1.3    1.0    0.7    0.7
                                                         0.190  0.190  0.190  0.190  0.190  0.190  0.190  0.190  0.190  0.190  0.190  0.190

Rural:   31818
               general           137.0      70.00          0.7    0.7    0.7    1.0    1.3    1.3    1.3    1.3    1.3    1.0    0.7    0.7
                                                         0.900  0.900  0.900  0.900  0.900  0.900  0.900  0.900  0.900  0.900  0.900  0.900



Livestock Data
--------------
Animal Type        Number     Intake     Consumption                   Groundwater Fractions (same for all livestock types)
-----------        ------   ----------   -----------    -----------------------------------------------------------------------------------------
                   x1,000   l/day/head        %           Jan    Feb    Mar    Apr    May    Jun    Jul    Aug    Sep    Oct    Nov    Dec
beef cattle          342       20.4         90.00
dairy cattle          14       54.0         70.00
horses                12       68.0         70.00
pigs                  99        6.0         70.00
sheep                 19        3.5         95.00
poultry              175        0.3         95.00
                                                         0.900  0.900  0.900  0.900  0.900  0.900  0.900  0.900  0.900  0.900  0.900  0.900
```

```
Industrial Data
_______________

                          Intake   Consumption                   Groundwater Fractions (decimal fraction of demanded intake)
Industry                 MCM/year  Percentage     Jan    Feb    Mar    Apr    May    Jun    Jul    Aug    Sep    Oct    Nov    Dec
--------                 --------- -----------  -----------------------------------------------------------------------------------
Agriculture                0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Forestry, etc.             0.001      75.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Metal Mines                0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Mineral Fuels              1.157      56.1      1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000
Non-Metal Mines            0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Food & Beverages           0.404       5.3      0.003  0.003  0.003  0.003  0.003  0.003  0.003  0.003  0.003  0.003  0.003  0.003
Tobacco                    0.000      24.2      0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030
Rubber & Plastics          0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Leather                    0.002       0.0      0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030
Textiles                   0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Wood                       0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Furniture                  0.007       0.0      0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030
Paper                      0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Printing                   0.005       2.9      0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030
Primary Metals- Iron       0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Primary Metals-Other       0.000       4.4      0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030
Metal Fabricating          0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Machinery                  0.048       3.4      0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030
Trans. Equipment           0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Electric Products          0.099       3.3      0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030
Non-Metal Minerals         0.095      45.4      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Petroleum & Coal           0.011      57.2      1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000
Chemicals                  0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Misc. Manufacture          0.018       8.6      0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030
Construction               0.000       0.0      0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030  0.030
Transportation             0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Electric Power             0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Other Utilities            0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Trade                      0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
Other                      0.000       0.0      0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000

Reservoir Data
______________

None


No. of Development Scenarios =  1
```

```
Scenario Number:    1

Development Year:   1987

Description:        1987 - Test Case Scenario


 0 Diversions


 0 Minimum Flow Requirements


 0 Energy Projects
```

APPENDIX D4

SAMPLE OUTPUT

MODULE 3B
List Irrigation Area Data

```
file:  MODULE3B.OUT

             Irrigation Area Detail File                              Date: TEST RUN 25/03/88     Page:  1

    Area I.D.:      AREA1
    Area Name:      IRRIGATION AREA 1

    No. Scenarios:  1

    Scenario Number:    1
    Development Year:  1987
    Description:       1987 TEST CASE SCENARIO


    Total Irrigated Area:         400   ha
    Delivery Efficiency:           85.0 %
    Delivery Evaporation Losses:   15.0 %

    Water Salinity (mmhos/cm):     0.000  0.000  0.000  0.000  0.368  0.350  0.330  0.332  0.347  0.000  0.000  0.000
    Monthly Groundwater Values:    0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000
    Off-Stream Storage (%):        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0

    Number of Crop Types:   3

    Crop   Crop   Description                 Area     Area     Irrigation
     No.   Code                                 %        ha      Level  (%)
    ----   ----   -----------                -----   --------   ----------
      1      1    wheat (grains)              45.0     180.0      50.0
      2      2    alfalfa (forages)           45.0     180.0      50.0
      3      3    potato (specialities)       10.0      40.0      50.0
                                             -----
                                             100.0

    Number of Soil Types:   2

    Soil   Soil   Description                 Area     Area
     No.   Code                                 %        ha
    ----   ----   -----------                -----   --------
      1      2    medium                      50.0     200.0
      2      3    med.-heavy                  50.0     200.0
                                             -----
                                             100.0

    Number of Irrigation Types:   4

    Type   Type   Description                 Area     Area     Application   Irrn Level
     No.   Code                                                 Efficiency    Adjustment
                                                %        ha          %          Factor
    ----   ----   -----------                -----   --------   -----------   ----------
      1      1    furrow                      10.0      40.0       55.0          1.20
      2      2    border dyke                 10.0      40.0       60.0          1.20
      3      3    wheel roll                  40.0     160.0       70.0          1.10
      4      4    center pivot 1              40.0     160.0       80.0          1.00
                                             -----
                                             100.0


    In-Season Rainfall Application Efficiency:    75.0 %
```

APPENDIX D5

SAMPLE OUTPUT

MODULE 3C
List Electrical Energy Data

```
file:  MODULE3C.OUT

              MODULE 3C:  List Electric Power Data                         Date: TEST RUN 25/03/88     Page:  1



   Thermal Power Database
   ----------------------
      Item          Number  Code    Description
      ----          ------  ----    -----------

   Hydrology          1      WET    Wet hydrologic year
                      2      AVG    Average hydrologic year
                      3      DRY    Dry hydrologic year

   Fuel Types         1      COL    Coal
                      2      OIL    Oil
                      3      GAS    Gas
                      4      NUC    Nuclear

   Cooling Types      1     ONCE    Once-through
                      2     POND    Pond
                      3     RESV    Reservoir
                      4     WTWR    Wet Tower
                      5     DTWR    Dry Tower

   Condenser Typ      1      LOW    Low  temp rise ( 8 deg C)
                      2      MED    Med. temp rise (11 deg C)
                      3      HIG    High temp rise (15 deg C)
```

```
Thermal Water Intake Coefficients (MCM/GWh)
-------------------------------------------

               ONCE      POND      RESV      WTWR      DTWR
               ----      ----      ----      ----      ----

LOW   COL     0.167     0.003     0.001     0.004     0.000
      OIL     0.167     0.003     0.001     0.004     0.000
      GAS     0.167     0.003     0.001     0.004     0.000
      NUC     0.207     0.004     0.002     0.006     0.000

MED   COL     0.136     0.003     0.001     0.004     0.000
      OIL     0.136     0.003     0.001     0.004     0.000
      GAS     0.136     0.003     0.001     0.004     0.000
      NUC     0.170     0.004     0.002     0.006     0.000

HIG   COL     0.100     0.003     0.001     0.004     0.000
      OIL     0.100     0.003     0.001     0.004     0.000
      GAS     0.100     0.003     0.001     0.004     0.000
      NUC     0.124     0.004     0.002     0.006     0.000
```

```
Thermal Water Consumption (MCM/GWh)
-----------------------------------

              ONCE       POND       RESV       WTWR       DTWR
              ----       ----       ----       ----       ----

LOW   COL     0.001      0.002      0.001      0.002      0.000
      OIL     0.001      0.002      0.001      0.002      0.000
      GAS     0.001      0.002      0.001      0.002      0.000
      NUC     0.002      0.002      0.002      0.003      0.000

MED   COL     0.001      0.002      0.001      0.002      0.000
      OIL     0.001      0.002      0.001      0.002      0.000
      GAS     0.001      0.002      0.001      0.002      0.000
      NUC     0.002      0.002      0.002      0.003      0.000

HIG   COL     0.001      0.002      0.001      0.002      0.000
      OIL     0.001      0.002      0.001      0.002      0.000
      GAS     0.001      0.002      0.001      0.002      0.000
      NUC     0.002      0.002      0.002      0.003      0.000
```

```
Hydrologic Record
-----------------

     Hydrologic Condition        No. Years    Percentage
     -------------------------   ---------    ----------

     Wet hydrologic year             5           50.0
     Average hydrologic year         4           40.0
     Dry hydrologic year             1           10.0
                                 ---------
                                    10

          Year  Hydrology             Year  Hydrology
          ----  ---------             ----  ---------

          1912     WET                1917     WET
          1913     WET                1918     AVG
          1914     AVG                1919     DRY
          1915     WET                1920     AVG
          1916     WET                1921     AVG
```

```
        MODULE 3C:  List Electric Power Data                                   Date: TEST RUN 25/03/88     Page:  5


Thermal Plant Data
------------------

Number      Thermal  Plant  Name        Capacity   Supply   Return   Fuel   Cooling   Condenser      Intake      Consume                        Off-stream storage/return (%)
------  ------------------------          (MW)      Node     Node    Type     Type       Type      (MCM/GWh)   (MCM/GWh)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
                                       --------   ------   ------   ----   -------   ---------   ---------   ---------  -----------------------------------------------------------------------------

   1     Thermal Plant No. 1             732.0       3        5      COL     POND        LOW        0.0020      0.0015     0.0   0.0  12.5  12.5  12.5  12.5  12.5  12.5  12.5  12.5   0.0   0.0
                                                                                                                            0.0   0.0   0.0   0.0  15.0  20.0  25.0  25.0  15.0   0.0   0.0   0.0
```

```
Hydro Station Data
------------------

                                         Node     Average    Overall     Flow      Installed
Number       Hydro  Plant  Name         Number    Head(m)   Efficiency   Factor   Capacity (MW)
------    -------------------------     ------    -------   ----------   ------   -------------

   1      Hydro Station No. 1              8        52.00      0.820     1.0000       186.00
```

APPENDIX D6

SAMPLE OUTPUT

MODULE 4
List Basin Configuration Data

```
file:  MODULE4.OUT

                 Basin Configuration File:  BASIN.DAT                              Date: TEST RUN 25/03/88     Page:  1

     Number of Network Nodes:  8
     Starting Node Number:     1
     ---------------------------
     Node    I.D.      No. Nodes   Upstream   Downstream
      No.               Upstream   Nodes         Node
     ----   -------   ---------   -- -- --   ----------
       1    RSRVR01       0        0  0  0        2
       2    NODE_02       1        1  0  0        3
       3    NODE_03       1        2  0  0        6
       4    NODE_04       0        0  0  0        6
       5    NODE_05       0        0  0  0        6
       6    NODE_06       3        3  4  5        7
       7    BNDRY07       1        6  0  0        8
       8    DUMMY08       1        7  0  0        0
```

```
        Basin Configuration File:  BASIN.DAT                            Date: TEST RUN 25/03/88     Page:  2

Number of Irrigation Areas:  7
------------------------------
Area   Area     Precip    Evap     Number of Nodes
 No.   I.D.      I.D.     I.D.     Supply  Return   Node   Type    Percent
----  -------  -------  -------   ------  ------   ----  ------   -------
  1    AREA1   GAGE_P1  GAGE_E1      1       1
                                                      2   supply    100.0
                                                      2   return    100.0
  2    AREA2   GAGE_P1  GAGE_E1      1       1
                                                      3   supply    100.0
                                                      3   return    100.0
  3    AREA3   GAGE_P1  GAGE_E1      1       1
                                                      5   supply    100.0
                                                      5   return    100.0
  4    AREA4   GAGE_P1  GAGE_E1      1       1
                                                      4   supply    100.0
                                                      4   return    100.0
  5    AREA5   GAGE_P1  GAGE_E1      1       1
                                                      6   supply    100.0
                                                      6   return    100.0
  6    AREA6   GAGE_P1  GAGE_E1      1       2
                                                      0   supply    100.0
                                                      0   return     55.0
                                                      4   return     45.0
  7    AREA7   GAGE_P2  GAGE_E1      1       2
                                                      0   supply    100.0
                                                      0   return     30.0
                                                      6   return     70.0
```

```
             Basin Configuration File:  BASIN.DAT                           Date: TEST RUN 25/03/88     Page:  3

                          Number of Irrigation Areas
Node    I.D.       Self    Upstream   Downstream   Area                  Percent
 No.              Supply    Return      Supply      No.      Type      Supply  Return
----  -------    ------   --------   ----------   ----   ----------    ------  ------
  1   RSRVR01       0         0           0
  2   NODE_02       1         0           0
                                                     1   SelfSupply    100.0   100.0
  3   NODE_03       1         0           0
                                                     2   SelfSupply    100.0   100.0
  4   NODE_04       1         1           0
                                                     4   SelfSupply    100.0   100.0
                                                     6   Upstream               45.0
  5   NODE_05       1         0           0
                                                     3   SelfSupply    100.0   100.0
  6   NODE_06       1         1           0
                                                     5   SelfSupply    100.0   100.0
                                                     7   Upstream               70.0
  7   BNDRY07       0         0           0
  8   DUMMY08       0         0           0
```

APPENDIX D7

SAMPLE OUTPUT

MODULE 5
Create Basin Configuration File

APPENDIX D7

SAMPLE OUTPUT

MODULE 5
Create Basin Configuration File

There is no printed output from this module, only the creation of the basin configuration file (BASIN.DAT). See Appendix C5.

APPENDIX D8

SAMPLE OUTPUT

MODULE 6
Generate Basin Hydrology

APPENDIX D8

SAMPLE OUTPUT

MODULE 6
Generate Basin Hydrology

There is no printed output from these modules, only the creation of the following files.

Module	Files	See Appendix
Module 6	Basin Hydrology File	C6
Module 6B	Gauge Hydrology File	C4
	Gauge Boundary File	C15
	Regulated Gauge Hydrology File	C31
Module 6C	Gauge Hydrology File	C4

APPENDIX D9

SAMPLE OUTPUT

MODULE 7
Generate Gauge Forecasts

```
file:  MODULE7.OUT

           MODULE 7:  Overall Industrial Forecasts                     Date: TEST RUN 25/03/88     Page:  1

   Case Description:    TEST RUN FOR USER MANUAL

   Forecast year:       1999
   Base year:           1981
   Number of years:       18

   Forecast scenario:      1,  Informetrica Limited


                                 Forecasted Growth Rates  (% annually)
                                 -------------------------------------------
   No.  Description              BC       Alberta  Sask     Manitoba Ontario  Quebec   NB       PEI      NS       Nfld

    1   Agriculture               2.076    1.910    3.341    3.317    1.344    2.188    1.099    0.749    2.027    2.551
    2   Forestry, etc.            1.079    3.478    6.312    2.626    2.709    2.985    3.595    2.029    1.538    1.791
    3   Metal Mines               2.558    1.758    4.939    1.489    1.056   -0.089    2.648   48.065    0.000   -0.694
    4   Mineral Fuels             4.395    1.063    1.745    3.301    2.709    0.000   -2.636  -11.719    0.000   35.790
    5   Non-Metal Mines           1.684    6.635    2.667    4.405    1.239    0.102    9.765   -2.530   -4.756    1.015
    6   Food & Beverages          2.498    2.243    1.999    1.582    1.943    1.263    2.359    1.487    0.548    3.795
    7   Tobacco                   0.000    0.000    0.000    0.000   -0.259   -0.261    0.000    0.000    0.000    0.000
    8   Rubber & Plastics         3.771    1.740    3.581    3.526    3.087    3.771    7.892    3.170    2.949    2.025
    9   Leather                   1.116    1.369    5.287    0.261    1.089    1.024    3.602    1.732    1.481    5.134
   10   Textiles                  3.844    1.165    3.008    4.597    2.652    1.248    2.431    1.928   -1.162    2.652
   11   Wood                      1.309    0.946    2.390    1.029    2.490    1.838    1.753    1.057    1.000    1.866
   12   Furniture                 1.813    0.332    2.844    1.494    2.844    2.394   -0.806    4.132    0.000    3.232
   13   Paper                     1.567    2.592   -1.103    1.637    2.594    2.777    0.797    0.957    0.000   -0.199
   14   Printing                  1.765    2.015    1.540    1.960    2.515    2.432    1.453    2.349    2.952    2.294
   15   Primary Metals- Iron     -0.994    1.870    1.727    2.099    2.220    3.376    5.084    0.264    0.000    0.000
   16   Primary Metals-Other     -0.994    1.870    1.727    2.099    2.220    3.376    5.084    0.264    0.000    0.000
   17   Metal Fabricating         1.521    1.211    1.947    0.919    2.037    1.628    3.108    1.466    4.969   -0.460
   18   Machinery                -0.029    3.657    1.082   -1.573    2.466    1.601    2.011   -0.271    5.914    3.996
   19   Trans. Equipment         -1.049    3.310    7.190    5.631    4.575    1.800    1.573    0.785   -5.581   -0.964
   20   Electric Products         1.045    3.895    1.884    1.161    2.677    2.538   -1.892    3.037    2.952    5.327
   21   Non-Metal Minerals        0.056    0.877    0.837    2.820    3.376    2.935    2.900    2.903    4.974    2.673
   22   Petroleum & Coal          2.255    2.787   -0.857    0.000    2.106   -2.358   -1.760    0.517    0.000   -0.100
   23   Chemicals                 1.096    3.499    2.487    0.443    1.961    1.961    1.627   -2.664    5.895   -2.108
   24   Misc. Manufacture         3.003    2.028    0.582    2.559    0.993    2.809   -1.937    3.606   16.385    2.418
   25   Construction             -0.457    0.919    2.101    4.263    2.625    2.450    0.899    0.851   -0.124    3.603
   26   Transportation            2.277    1.732    2.661    2.510    2.666    1.628    3.065    2.368    1.124    2.198
   27   Electric Power            2.065    2.496    2.353    3.596    2.410    3.186    3.585    1.981    2.291    2.242
   28   Other Utilities           2.065    2.496    2.353    3.596    2.410    3.186    3.585    1.981    2.291    2.242
   29   Trade                     1.739    1.960    2.255    2.437    3.099    2.498    1.388    2.538    1.926    2.791
   30   Other                     1.687    2.239    2.521    1.555    2.691    2.160    1.953    2.016    1.922    2.031
```

```
        MODULE 7:  Overall Industrial Forecasts                              Date: TEST RUN 25/03/88     Page:  2

   Case Description:   TEST RUN FOR USER MANUAL

   Forecast year:        1999
   Base year:            1981
   Number of years:        18

   Forecast scenario:      1,  Informetrica Limited


                                 Forecasted Growth Factors
                                 ----------------------------------------
   No.  Description              BC      Alberta  Sask    Manitoba Ontario  Quebec   NB       PEI      NS       Nfld

    1   Agriculture                1.447    1.406    1.807    1.799    1.272    1.476    1.217    1.144    1.435    1.574
    2   Forestry, etc.             1.213    1.850    3.010    1.594    1.618    1.698    1.888    1.436    1.316    1.376
    3   Metal Mines                1.576    1.368    2.381    1.305    1.208    0.984    1.601 1169.941    1.000    0.882
    4   Mineral Fuels              2.169    1.210    1.365    1.794    1.618    1.000    0.618    0.106    1.000  246.404
    5   Non-Metal Mines            1.351    3.178    1.606    2.172    1.248    1.018    5.350    0.630    0.416    1.199
    6   Food & Beverages           1.559    1.491    1.428    1.326    1.414    1.253    1.521    1.304    1.103    1.955
    7   Tobacco                    1.000    1.000    1.000    1.000    0.954    0.954    1.000    1.000    1.000    1.000
    8   Rubber & Plastics          1.947    1.364    1.884    1.866    1.729    1.947    3.925    1.754    1.687    1.435
    9   Leather                    1.221    1.277    2.528    1.048    1.215    1.201    1.891    1.362    1.303    2.463
   10   Textiles                   1.972    1.232    1.705    2.246    1.602    1.250    1.541    1.411    0.810    1.602
   11   Wood                       1.264    1.185    1.530    1.202    1.557    1.388    1.367    1.208    1.196    1.395
   12   Furniture                  1.382    1.061    1.657    1.306    1.657    1.531    0.864    2.073    1.000    1.773
   13   Paper                      1.323    1.585    0.819    1.339    1.585    1.637    1.154    1.187    1.000    0.965
   14   Printing                   1.370    1.432    1.317    1.416    1.564    1.541    1.297    1.519    1.688    1.504
   15   Primary Metals- Iron       0.835    1.396    1.361    1.453    1.485    1.818    2.442    1.049    1.000    1.000
   16   Primary Metals-Other       0.835    1.396    1.361    1.453    1.485    1.818    2.442    1.049    1.000    1.000
   17   Metal Fabricating          1.312    1.242    1.415    1.179    1.438    1.337    1.735    1.300    2.394    0.920
   18   Machinery                  0.995    1.909    1.214    0.752    1.550    1.331    1.431    0.952    2.813    2.025
   19   Trans. Equipment           0.827    1.797    3.490    2.681    2.237    1.379    1.324    1.151    0.356    0.840
   20   Electric Products          1.206    1.989    1.399    1.231    1.609    1.570    0.709    1.713    1.688    2.545
   21   Non-Metal Minerals         1.010    1.170    1.162    1.650    1.818    1.683    1.673    1.674    2.396    1.608
   22   Petroleum & Coal           1.494    1.640    0.857    1.000    1.455    0.651    0.726    1.097    1.000    0.982
   23   Chemicals                  1.217    1.857    1.556    1.083    1.418    1.418    1.337    0.615    2.804    0.682
   24   Misc. Manufacture          1.703    1.435    1.110    1.576    1.195    1.646    0.703    1.892   15.351    1.537
   25   Construction               0.921    1.179    1.454    2.120    1.594    1.546    1.175    1.165    0.978    1.891
   26   Transportation             1.500    1.362    1.604    1.562    1.606    1.337    1.722    1.524    1.223    1.479
   27   Electric Power             1.445    1.559    1.520    1.889    1.535    1.759    1.885    1.423    1.503    1.491
   28   Other Utilities            1.445    1.559    1.520    1.889    1.535    1.759    1.885    1.423    1.503    1.491
   29   Trade                      1.364    1.418    1.494    1.542    1.732    1.559    1.282    1.570    1.410    1.641
   30   Other                      1.351    1.490    1.565    1.320    1.613    1.469    1.416    1.432    1.409    1.436


  NOTE: the "Forecast Intake" amounts in the following sectors are
        set to zero in each gauge .RUN file, since the sector can
        be modeled in greater detail in other program modules

   1 - Agriculture
  27 - Electric Power
```

```
            MODULE 7:  Gauge Forecast Details                                  Date: TEST RUN 25/03/88     Page:  3

Case Description: TEST RUN FOR USER MANUAL
Node:              1, Reservoir No. 1
Province:          2, Alberta
Forecast Year:    1999              Forecast Scenarios Population:  1, Stats Canada 1
Base Year:        1981                                 Livestock:   1, low
Number of Years:    18                                 Industry:    1, Informetrica Limited
                                                                       (without regional effects)
                                                       Development: 1, 1987 - Test Case Scneario

                                 Base      Escalation       Pricing  Forecast
     Item                        Value        Rate          Factor    Value
     ----------                 -------  ----------------   -------  --------
                                                             1.000
     population, urban             0    143.5 / 1,000                    0
                 rural             0    143.5 / 1,000                    0
     beef cattle                   0      1.02 % annually                0
     dairy cattle                  0     -1.67 % annually                0
     horses                        0     -1.07 % annually                0
     pigs                          0     -1.45 % annually                0
     sheep                         0     -2.05 % annually                0
     poultry                       0     -1.21 % annually                0

     Industrial                   Base     Growth   Distrn   Efficy   Pricng      Forecast
No.  Sector                      Intake    Factor   Factor   Factor   Factor       Intake
---  ----------                 --------   ------   ------   ------   ------      --------
                                MCM/year                                          MCM/year
  1  Agriculture                  0.000     1.406    1.000    1.000    1.000         0.000
  2  Forestry, etc.               0.000     1.850    1.000    1.000    1.000         0.000
  3  Metal Mines                  0.000     1.368    1.000    1.000    1.000         0.000
  4  Mineral Fuels                0.000     1.210    1.000    1.000    1.000         0.000
  5  Non-Metal Mines              0.000     3.178    1.000    1.000    1.000         0.000
  6  Food & Beverages             0.000     1.491    1.000    1.000    1.000         0.000
  7  Tobacco                      0.000     1.000    1.000    1.000    1.000         0.000
  8  Rubber & Plastics            0.000     1.364    1.000    1.000    1.000         0.000
  9  Leather                      0.000     1.277    1.000    1.000    1.000         0.000
 10  Textiles                     0.000     1.232    1.000    1.000    1.000         0.000
 11  Wood                         0.000     1.185    1.000    1.000    1.000         0.000
 12  Furniture                    0.000     1.061    1.000    1.000    1.000         0.000
 13  Paper                        0.000     1.585    1.000    1.000    1.000         0.000
 14  Printing                     0.000     1.432    1.000    1.000    1.000         0.000
 15  Primary Metals- Iron         0.000     1.396    1.000    1.000    1.000         0.000
 16  Primary Metals-Other         0.000     1.396    1.000    1.000    1.000         0.000
 17  Metal Fabricating            0.000     1.242    1.000    1.000    1.000         0.000
 18  Machinery                    0.000     1.909    1.000    1.000    1.000         0.000
 19  Trans. Equipment             0.000     1.797    1.000    1.000    1.000         0.000
 20  Electric Products            0.000     1.989    1.000    1.000    1.000         0.000
 21  Non-Metal Minerals           0.000     1.170    1.000    1.000    1.000         0.000
 22  Petroleum & Coal             0.000     1.640    1.000    1.000    1.000         0.000
 23  Chemicals                    0.000     1.857    1.000    1.000    1.000         0.000
 24  Misc. Manufacture            0.000     1.435    1.000    1.000    1.000         0.000
 25  Construction                 0.000     1.179    1.000    1.000    1.000         0.000
 26  Transportation               0.000     1.362    1.000    1.000    1.000         0.000
 27  Electric Power               0.000     1.559    1.000    1.000    1.000         0.000
 28  Other Utilities              0.000     1.559    1.000    1.000    1.000         0.000
 29  Trade                        0.000     1.418    1.000    1.000    1.000         0.000
 30  Other                        0.000     1.490    1.000    1.000    1.000         0.000
```

```
        MODULE 7:  Gauge Forecast Details                                    Date: TEST RUN 25/03/88     Page:  4

Case Description: TEST RUN FOR USER MANUAL
Node:              2, Node 2
Province:          2, Alberta
Forecast Year:    1999             Forecast Scenarios Population:  1, Stats Canada 1
Base Year:        1981                                Livestock:   1, low
Number of Years:    18                                Industry:    1, Informetrica Limited
                                                                      (without regional effects)
                                                      Development: 1, 1987 - Test Case Scenario

     Item                     Base       Escalation        Pricing   Forecast
     ----------               Value         Rate            Factor    Value
                             -------   ----------------   -------   --------
                                                            1.000
     population, urban         68242   143.5 / 1,000                  78034
                 rural         31818   143.5 / 1,000                  36383
     beef cattle                 342     1.02 % annually                410
     dairy cattle                 14    -1.67 % annually                 10
     horses                       12    -1.07 % annually                  9
     pigs                         99    -1.45 % annually                 76
     sheep                        19    -2.05 % annually                 13
     poultry                     175    -1.21 % annually                140

     Industrial                 Base     Growth   Distrn   Efficy   Pricng     Forecast
No.  Sector                    Intake    Factor   Factor   Factor   Factor      Intake
---  ----------               --------   ------   ------   ------   ------     --------
                              MCM/year                                         MCM/year
  1  Agriculture               0.000     1.406    1.000    1.000    1.000       0.000
  2  Forestry, etc.            0.001     1.850    1.000    1.000    1.000       0.002
  3  Metal Mines               0.000     1.368    1.000    1.000    1.000       0.000
  4  Mineral Fuels             1.157     1.210    1.000    1.000    1.000       1.399
  5  Non-Metal Mines           0.000     3.178    1.000    1.000    1.000       0.000
  6  Food & Beverages          0.404     1.491    1.000    1.000    1.000       0.602
  7  Tobacco                   0.000     1.000    1.000    1.000    1.000       0.000
  8  Rubber & Plastics         0.000     1.364    1.000    1.000    1.000       0.000
  9  Leather                   0.002     1.277    1.000    1.000    1.000       0.002
 10  Textiles                  0.000     1.232    1.000    1.000    1.000       0.000
 11  Wood                      0.000     1.185    1.000    1.000    1.000       0.000
 12  Furniture                 0.007     1.061    1.000    1.000    1.000       0.007
 13  Paper                     0.000     1.585    1.000    1.000    1.000       0.000
 14  Printing                  0.005     1.432    1.000    1.000    1.000       0.007
 15  Primary Metals- Iron      0.000     1.396    1.000    1.000    1.000       0.000
 16  Primary Metals-Other      0.000     1.396    1.000    1.000    1.000       0.000
 17  Metal Fabricating         0.000     1.242    1.000    1.000    1.000       0.000
 18  Machinery                 0.048     1.909    1.000    1.000    1.000       0.091
 19  Trans. Equipment          0.000     1.797    1.000    1.000    1.000       0.000
 20  Electric Products         0.099     1.989    1.000    1.000    1.000       0.197
 21  Non-Metal Minerals        0.095     1.170    1.000    1.000    1.000       0.111
 22  Petroleum & Coal          0.011     1.640    1.000    1.000    1.000       0.018
 23  Chemicals                 0.000     1.857    1.000    1.000    1.000       0.000
 24  Misc. Manufacture         0.018     1.435    1.000    1.000    1.000       0.026
 25  Construction              0.000     1.179    1.000    1.000    1.000       0.000
 26  Transportation            0.000     1.362    1.000    1.000    1.000       0.000
 27  Electric Power            0.000     1.559    1.000    1.000    1.000       0.000
 28  Other Utilities           0.000     1.559    1.000    1.000    1.000       0.000
 29  Trade                     0.000     1.418    1.000    1.000    1.000       0.000
 30  Other                     0.000     1.490    1.000    1.000    1.000       0.000
```

APPENDIX D10

SAMPLE OUTPUT

MODULE 7B
Generate Irrigation Area Forecasts

```
file:  MODULE7B.OUT

              MODULE 7b:  Irrigation  Area  Calculations                          Date: TEST RUN 25/03/88     Page:  1

    Area I.D.:      AREA1

    Evap. File:     GAGE_E1
    Precip. File:   GAGE_P1

    Scenario:       1

    Forecast Year: 1999


    Weighted Soil Type Parameters
    -----------------------------
    Moisture Capacity:            155.00 mm/m
    Leaching Efficiency:           62.50 %
    Percolation Efficiency:        17.50 %

    Weighted Irrigation Type Parameters
    -----------------------------------
    Application Efficiency:        71.50 %
    Irrgn Level Adjustment:         1.08
    High Frequency Application:     0.00 %
    Low  Frequency Application:   100.00 %

    Area Parameters
    ---------------
    Total Irrigated Area:            400 ha
    Delivery Efficiency:           85.00 %
    Delivery Evaporation Loss:     15.00 %
    Rainfall Appln Efficiency:     75.00 %

    Monthly Parameters                        May      Jun      Jul      Aug      Sep
    ------------------                      -------  -------  -------  -------  -------
    Average Evapotranspiration (mm)         153.800  173.000  189.050  176.900  126.500
    Water Salinity (mmohs/cm):                0.368    0.350    0.330    0.332    0.347

                                Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep      Oct      Nov      Dec
                              -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------
    Off-Stream Storage (%):     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
    Groundwater Fraction:      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000

    NOTE:  Groundwater is a fraction of demanded intake, and as such, it can only be applied to irrigation months.
```

```
         MODULE 7b:  Irrigation  Area  Calculations                     Date: TEST RUN 25/03/88     Page:  2

 Crop Type Parameters  (based on average evapotranspiration)
 --------------------


 Crop Type:                   1
 Crop Code:                   1   wheat (grains)
 Crop Area, % of total:     45.0
 Crop Area, ha:            180.0
 Adjusted Irrgn Level:      54.0
                                       May     Jun     Jul     Aug     Sep
                                     ------  ------  ------  ------  ------
 Crop Potential ET (mm):              38.45  141.86  209.85   83.14   31.62
 Rooting Depth (m):                    0.26    0.77    1.18    1.20    1.20
 Max. Optimal Depletion:               0.70    0.51    0.41    0.70    0.70
 Standard Irrgn Application (mm):     28.64   61.16   75.46  130.20  130.20
 Optimal  Irrgn Application (mm):     22.51   43.30   48.11  102.30  102.30
 Actual   Irrgn Application (mm):     12.15   23.38   25.98   55.24   55.24
 Leaching Requirement (mm):            1.07    2.20    3.07    1.22    0.49


 Crop Type:                   2
 Crop Code:                   2   alfalfa (forages)
 Crop Area, % of total:     45.0
 Crop Area, ha:            180.0
 Adjusted Irrgn Level:      54.0
                                       May     Jun     Jul     Aug     Sep
                                     ------  ------  ------  ------  ------
 Crop Potential ET (mm):             123.04  162.62  179.60  146.83   92.35
 Rooting Depth (m):                    1.50    1.50    1.50    1.50    1.50
 Max. Optimal Depletion:               0.57    0.47    0.45    0.51    0.67
 Standard Irrgn Application (mm):    132.73  110.02  105.70  119.33  154.67
 Optimal  Irrgn Application (mm):     97.85   75.14   70.82   84.45  119.80
 Actual   Irrgn Application (mm):     52.84   40.58   38.25   45.61   64.69
 Leaching Requirement (mm):            4.52    5.66    5.87    4.83    3.18


 Crop Type:                   3
 Crop Code:                   3   potato (specialities)
 Crop Area, % of total:     10.0
 Crop Area, ha:             40.0
 Adjusted Irrgn Level:      54.0
                                       May     Jun     Jul     Aug     Sep
                                     ------  ------  ------  ------  ------
 Crop Potential ET (mm):              44.60  110.72  168.25  162.75   65.78
 Rooting Depth (m):                    0.19    0.42    0.60    0.60    0.60
 Max. Optimal Depletion:               0.60    0.32    0.24    0.28    0.55
 Standard Irrgn Application (mm):     17.30   20.67   22.74   25.85   51.34
 Optimal  Irrgn Application (mm):     17.30   20.67   22.74   25.85   51.34
 Actual   Irrgn Application (mm):      9.34   11.16   12.28   13.96   27.73
 Leaching Requirement (mm):            2.28    5.35    7.63    7.43    3.15
```

```
        MODULE 7b:  Irrigation  Area  Calculations                          Date: TEST RUN 25/03/88     Page:  3

     Seasonal Root Zone Moisture Balance  (in mm)
     --------------------------------------------
                 wheat (grains)                          alfalfa (forages)                       potato (specialities)           Seasonal Usage (in MCM)
     ---------------------------------------  ---------------------------------------  ---------------------------------------  -----------------------
     Initial Effectv Effectv  Actual  Final   Initial Effectv Effectv  Actual  Final   Initial Effectv Effectv  Actual  Final
Year Depletn Rainfal Irrigat Crop ET Depletn  Depletn Rainfal Irrigat Crop ET Depletn  Depletn Rainfal Irrigat Crop ET Depletn   Intake Consume  Return
---- ------- ------- ------- ------- -------  ------- ------- ------- ------- -------  ------- ------- ------- ------- -------  ------- ------- -------
1912   93.00  128.00  342.96  469.47   91.51   116.25  132.18  533.77  676.28  126.57    46.50  118.50  332.44  456.53   52.10    2.815   1.774   1.041
1913   82.27  198.20  285.54  484.61   83.15   115.58  202.86  455.60  675.11  132.22    40.55  192.75  271.86  464.27   40.20    2.374   1.496   0.878
1914   74.46  146.29  327.65  478.65   79.18   119.07  153.76  509.47  675.96  131.79    32.00  141.00  300.23  444.12   34.89    2.677   1.687   0.990
1915   70.48  334.82  182.52  496.86   50.00   117.54  336.63  374.90  691.22   97.23    27.89  327.00  194.39  529.97   36.48    1.790   1.128   0.662
1916   46.96  236.08  244.08  493.59   60.39    90.72  241.67  405.62  679.98  123.40    30.64  227.25  265.47  512.15   50.07    2.109   1.329   0.780
1917   50.43  130.60  299.12  464.09   84.80   100.16  139.12  498.95  672.93  135.01    26.24  128.25  307.32  446.19   36.87    2.576   1.624   0.953
1918   75.99   86.29  362.29  460.87   88.29   121.64   90.02  567.81  659.19  123.00    29.94   81.00  350.74  452.38   50.58    2.986   1.882   1.104
1919   77.03  133.70  342.31  470.73   71.75   109.42  137.75  522.08  671.71  121.30    36.35  126.00  322.02  452.23   40.56    2.772   1.747   1.025
1920   59.74  108.29  335.75  479.78   95.48   101.09  112.50  537.39  678.46  129.66    25.72   99.75  330.92  452.53   47.58    2.811   1.772   1.039
1921   80.41  217.51  273.30  475.77   65.37   112.28  220.15  463.84  677.57  105.86    32.60  209.25  288.94  509.73   44.14    2.380   1.500   0.880


                             SUMMARY OF IRRIGATION USAGE  (in MCM)                        YEAR OF OCCURRENCE
        -------------------------------------------------------------------------------    ----------------
        MINIMUM       ACTUAL           AVERAGE          MAXIMUM      ACTUAL                 Intake
        -------  ----------------  -------------------------  -------  ----------------    ----------------
         Intake  Consume   Return   Intake  Consume   Return   Intake  Consume   Return     MINIMUM  MAXIMUM
        -------  -------  -------  -------  -------  -------  -------  -------  -------     -------  -------
 May      0.167    0.105    0.062    0.202    0.127    0.075    0.361    0.228    0.134        1915     1914
 Jun      0.317    0.200    0.117    0.512    0.323    0.189    0.682    0.430    0.252        1915     1918
 Jul      0.490    0.309    0.181    0.764    0.482    0.283    0.911    0.574    0.337        1915     1917
 Aug      0.489    0.308    0.181    0.535    0.337    0.198    0.642    0.405    0.237        1915     1920
 Sep      0.327    0.206    0.121    0.516    0.325    0.191    0.605    0.381    0.224        1915     1920

Season    1.790    1.128    0.662    2.529    1.594    0.935    2.986    1.882    1.104        1915     1918
```

APPENDIX D11

SAMPLE OUTPUT

MODULE 7C
Generate Thermal Plant Water Use Forecasts

```
file:  MODULE7C.OUT

           MODULE7C:  Electrical Plant Characteristics                    Date: TEST RUN 03/25/88     Page:  1


     Forecast Year:     1999
     Development Year: 1987
     Scenario Number:     1     1987 - Test Case Scenario

     Number of years of hydrologic date:   10

     Wet hydrologic year       occurs   5 times.
     Average hydrologic year   occurs   4 times.
     Dry hydrologic year       occurs   1 times.
```

```
          MODULE7C:  Thermal Plant Characteristics                                    Date: TEST RUN 03/25/88     Page:  2

1 Thermal Plant No. 1
  Installed Capacity:    730.00 MW
  Fuel Type:            COL
  Cooling Type:         POND
  Condenser Type:       LOW
  Supply Node:                  3
  Return Node:                  5
  Intake Coefficient:      0.0029 MCM/GWh
  Consumption Coeff.:      0.0015 MCM/GWh
                                                   Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep      Oct      Nov      Dec     Total
                                                  -----    -----    -----    -----    -----    -----    -----    -----    -----    -----    -----    -----    -----
  Wet hydrologic year
        Monthly Plant Energy      (Gwh):         319.50   310.50   153.00   324.00   315.00   297.00   315.00   225.00   229.50   328.50   301.50   351.00
        Monthly Plant Intake      (MCM):           0.93     0.91     0.45     0.95     0.92     0.87     0.92     0.66     0.67     0.96     0.88     1.03    10.15
        Monthly Plant Returns     (MCM):           0.47     0.45     0.22     0.47     0.46     0.43     0.46     0.33     0.34     0.48     0.44     0.51     5.08
        Monthly River Withdrawals (MCM):           0.00     0.00     1.27     1.27     1.27     1.27     1.27     1.27     1.27     1.27     0.00     0.00
        Monthly Returns to River  (MCM):           0.00     0.00     0.00     0.00     0.76     1.02     1.27     1.27     0.76     0.00     0.00     0.00
  Average hydrologic year
        Monthly Plant Energy      (Gwh):         355.00   345.00   170.00   360.00   350.00   330.00   350.00   250.00   255.00   365.00   335.00   390.00
        Monthly Plant Intake      (MCM):           1.04     1.01     0.50     1.05     1.02     0.97     1.02     0.73     0.75     1.07     0.98     1.14    11.28
        Monthly Plant Returns     (MCM):           0.52     0.50     0.25     0.53     0.51     0.48     0.51     0.37     0.37     0.53     0.49     0.57     5.64
        Monthly River Withdrawals (MCM):           0.00     0.00     1.41     1.41     1.41     1.41     1.41     1.41     1.41     1.41     0.00     0.00
        Monthly Returns to River  (MCM):           0.00     0.00     0.00     0.00     0.85     1.13     1.41     1.41     0.85     0.00     0.00     0.00
  Dry hydrologic year
        Monthly Plant Energy      (Gwh):         390.50   379.50   187.00   396.00   385.00   363.00   385.00   275.00   280.50   401.50   368.50   429.00
        Monthly Plant Intake      (MCM):           1.14     1.11     0.55     1.16     1.13     1.06     1.13     0.80     0.82     1.17     1.08     1.25    12.40
        Monthly Plant Returns     (MCM):           0.57     0.56     0.27     0.58     0.56     0.53     0.56     0.40     0.41     0.59     0.54     0.63     6.20
        Monthly River Withdrawals (MCM):           0.00     0.00     1.55     1.55     1.55     1.55     1.55     1.55     1.55     1.55     0.00     0.00
        Monthly Returns to River  (MCM):           0.00     0.00     0.00     0.00     0.93     1.24     1.55     1.55     0.93     0.00     0.00     0.00
```

```
         MODULE7C:  Hydro Station Characteristics                          Date: TEST RUN 03/25/88     Page:  3

Station                              Node   Installed   Average   Average    Flow
No.  Name                             No.   Capacity     Head    Efficiency Factor
---  -------------------------       ----   ---------   -------   --------   ------
                                              (MW)        (m)
 1   Hydro Station No. 1               8       186.00     52.00     0.8200   1.0000
```

APPENDIX D12

SAMPLE OUTPUT

MODULE 8
Perform Historical Simulation

Forecasted Demands Summary
(MODULE8.DMD)

```
          Historical Simulation:  Demands & Avg. Flows (MCM)              Date: TEST RUN 25/03/88     Page: 1

Forecast Year:   1990                              TEST RUN FOR USER MANUAL
Seasonal Months:  May  to  Sep  (inclusive)

                             Jan           Feb           Mar           Apr           May           Jun           Jul           Aug           Sep           Oct           Nov           Dec          Season        Annual
                       ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- -------------
                       intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum
                       ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
Node:  1
I.D.: RSRVR01
Name: Reservoir No. 1
      domestic           0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      livestock          0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      industrial         0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      energy projects    0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      Avg. Generation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
      Avg. Irrigation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
                       ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
      Total Demand        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
      Local Inflow       12.6          10.3          19.5          85.4         138.5         201.1         204.5         124.2          88.4          58.0          28.9          14.1         772.5        1002.5
      Generatn Return     0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Irrigatn Return     0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Groundwater         0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Diversions          0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Minimum Flows       0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Res. Evaporatn     -0.3          -0.1           0.0          -0.1          -0.1           0.4           1.0           1.3           1.0           0.8          -0.2          -0.2           3.6           3.5
Node:  2
I.D.: NODE_02
Name: Node 2
      domestic           0.83   0.22   0.75   0.20   0.82   0.22   1.15   0.30   1.34   0.41   1.48   0.40   1.34   0.41   1.54   0.41   1.48   0.40   1.10   0.31   0.80   0.21   0.83   0.22   7.60   2.02  13.68   3.71
      livestock          0.31   0.27   0.28   0.24   0.31   0.27   0.30   0.28   0.31   0.27   0.30   0.28   0.31   0.27   0.31   0.27   0.30   0.28   0.31   0.27   0.30   0.28   0.31   0.27   1.54   1.34   3.67   3.18
      industrial         0.21   0.07   0.21   0.07   0.21   0.07   0.21   0.07   0.21   0.07   0.21   0.07   0.21   0.07   0.21   0.07   0.21   0.07   0.21   0.07   0.21   0.07   0.21   0.07   1.03   0.37   2.46   0.80
      energy projects    0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      Avg. Generation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
      Avg. Irrigation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.2    0.1    0.5    0.3    0.8    0.5    0.5    0.3    0.5    0.3    0.0    0.0    0.0    0.0    0.0    0.0    2.5    1.6    2.5    1.6
                       ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
      Total Demand        1.3    0.6    1.2    0.5    1.3    0.6    1.7    0.8    2.3    0.9    2.5    1.1    2.8    1.2    2.6    1.1    2.5    1.1    1.7    0.7    1.3    0.5    1.3    0.6   12.7    5.3   22.6    9.4
      Local Inflow       13.6          11.2          21.1          92.0         168.4         216.4         220.1         133.7          93.0          62.5          32.3          15.3         831.6        1070.5
      Generatn Return     0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Irrigatn Return     0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Groundwater         0.6           0.6           0.6           0.7           0.8           0.8           0.8           0.8           0.8           0.7           0.6           0.6           4.1           8.7
      Diversions          0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Minimum Flows       0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
Node:  3
I.D.: NODE_03
Name: Node 3
      domestic           0.20   0.08   0.18   0.07   0.20   0.08   0.27   0.11   0.37   0.15   0.35   0.15   0.37   0.15   0.37   0.15   0.35   0.15   0.28   0.12   0.19   0.08   0.20   0.08   1.81   0.75   3.32   1.38
      livestock          0.22   0.19   0.20   0.18   0.22   0.19   0.22   0.18   0.22   0.18   0.22   0.18   0.22   0.18   0.22   0.18   0.22   0.18   0.22   0.19   0.22   0.18   0.22   0.19   1.11   0.90   2.64   2.20
      industrial         0.34   0.27   0.34   0.27   0.34   0.27   0.34   0.27   0.34   0.27   0.34   0.27   0.34   0.27   0.34   0.27   0.34   0.27   0.34   0.27   0.34   0.27   0.34   0.27   1.70   1.37   4.08   3.28
      energy projects    0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      Avg. Generation     1.0    1.0    1.0    1.0    0.5    0.5    1.0    1.0    1.0    1.0    0.9    0.9    1.0    1.0    0.7    0.7    0.7    0.7    1.0    1.0    0.9    0.9    1.1    1.1    4.3    4.3   10.8   10.8
      Avg. Irrigation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.4    0.3    1.0    0.6    1.5    1.0    1.0    0.7    1.0    0.6    0.0    0.0    0.0    0.0    0.0    0.0    5.0    3.1    5.0    3.1
                       ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
      Total Demand        1.8    1.5    1.7    1.5    1.2    1.0    1.8    1.6    2.3    1.8    2.8    2.2    3.4    2.6    2.7    2.0    2.7    2.0    1.8    1.6    1.7    1.5    1.8    1.6   13.9   10.5   25.9   20.9
      Local Inflow        0.5           0.6          13.5          65.4          23.6           4.4          53.6          15.4          18.4           7.2           5.8           1.9         116.4         211.3
      Generatn Return     0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Irrigatn Return     0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Groundwater         0.3           0.3           0.3           0.4           0.4           0.4           0.4           0.4           0.4           0.4           0.3           0.3           2.0           4.3
      Diversions          0.0           0.0           0.0          -5.3          -5.3          -5.3          -5.3          -5.3          -5.3          -5.3           0.0           0.0         -26.4         -37.0
      Minimum Flows       0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
```

```
              Historical Simulation:  Demands & Avg. Flows (MCM)                       Date: TEST RUN 25/03/88    Page:  2

Forecast Year:    1990                                  TEST RUN FOR USER MANUAL
Seasonal Months:  May  to  Sep  (inclusive)

                             Jan           Feb           Mar           Apr           May           Jun           Jul           Aug           Sep           Oct           Nov           Dec          Season         Annual
                        ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- -------------
                         intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum
                         ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
Node:  4
I.D.:  NODE_04
Name:  Node 4
        domestic           0.10   0.04   0.09   0.03   0.10   0.04   0.14   0.05   0.19   0.07   0.18   0.07   0.19   0.07   0.19   0.07   0.18   0.07   0.14   0.05   0.10   0.04   0.10   0.04   0.93   0.34   1.71   0.63
        livestock          0.07   0.06   0.06   0.06   0.07   0.06   0.07   0.06   0.07   0.06   0.07   0.06   0.07   0.06   0.07   0.06   0.07   0.06   0.07   0.06   0.07   0.06   0.07   0.06   0.35   0.30   0.83   0.72
        industrial         0.33   0.27   0.33   0.27   0.33   0.27   0.33   0.27   0.33   0.27   0.33   0.27   0.33   0.27   0.33   0.27   0.33   0.27   0.33   0.27   0.33   0.27   0.33   0.27   1.65   1.35   3.96   3.25
        energy projects    0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        Avg. Generation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
        Avg. Irrigation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.2    0.1    0.5    0.3    0.8    0.5    0.5    0.3    0.5    0.3    0.0    0.0    0.0    0.0    0.0    0.0    2.5    1.6    2.5    1.6
                         ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
        Total Demand        0.5    0.4    0.5    0.4    0.5    0.4    0.5    0.4    0.8    0.5    1.1    0.7    1.3    0.8    1.1    0.7    1.1    0.7    0.5    0.4    0.5    0.4    0.5    0.4    5.4    3.4    8.9    6.2
        Local Inflow        0.1           0.2           3.7          17.7           6.4           1.2          14.5           4.2           5.2           1.8           1.6           0.5          31.5          57.1
        Generatn Return     0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
        Irrigatn Return     0.0           0.0           0.0           0.0           3.6           8.3          12.1           8.9           9.0           0.0           0.0           0.0          41.8          41.8
        Groundwater         0.1           0.1           0.1           0.1           0.2           0.2           0.2           0.2           0.2           0.2           0.1           0.1           0.8           1.8
        Diversions          0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
        Minimum Flows       0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
Node:  5
I.D.:  NODE_05
Name:  Node 5
        domestic           0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.01   0.00   0.01   0.00   0.01   0.00   0.01   0.00   0.01   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.03   0.02   0.05   0.04
        livestock          0.03   0.03   0.03   0.02   0.03   0.03   0.03   0.02   0.03   0.03   0.03   0.02   0.03   0.03   0.03   0.03   0.03   0.02   0.03   0.03   0.03   0.02   0.03   0.03   0.14   0.13   0.34   0.30
        industrial         0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        energy projects    0.09   0.02   0.09   0.02   0.09   0.02   0.09   0.02   0.09   0.02   0.09   0.02   0.09   0.02   0.09   0.02   0.09   0.02   0.09   0.02   0.09   0.02   0.09   0.02   0.44   0.11   1.06   0.26
        Avg. Generation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
        Avg. Irrigation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    5.2    3.3   11.6    7.3   18.6   11.7   12.5    7.9   12.9    8.2    0.0    0.0    0.0    0.0    0.0    0.0   60.9   38.4   60.9   38.4
                         ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
        Total Demand        0.1    0.0    0.1    0.0    0.1    0.0    0.1    0.0    5.3    3.3   11.7    7.4   18.7   11.8   12.6    7.9   13.1    8.2    0.1    0.1    0.1    0.0    0.1    0.0   61.5   38.6   62.3   38.8
        Local Inflow        0.1           0.2           3.8          18.5           6.7           1.2          15.2           4.4           5.5           2.0           1.7           0.5          32.9          59.7
        Generatn Return     0.0           0.0           0.0           0.0           0.8           1.1           1.4           1.4           0.8           0.0           0.0           0.0           5.4           5.4
        Irrigatn Return     0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
        Groundwater         0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.2           0.4
        Diversions          0.0           0.0           0.0           0.0           9.4          11.4          13.2          13.2           5.7           0.0           0.0           0.0          53.0          53.0
        Minimum Flows       0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
Node:  6
I.D.:  NODE_06
Name:  Node 6
        domestic           0.08   0.04   0.08   0.03   0.08   0.04   0.12   0.05   0.16   0.07   0.15   0.06   0.16   0.07   0.16   0.07   0.15   0.06   0.12   0.05   0.08   0.03   0.08   0.04   0.77   0.32   1.41   0.56
        livestock          0.16   0.14   0.14   0.13   0.16   0.14   0.15   0.13   0.16   0.14   0.15   0.13   0.16   0.14   0.16   0.14   0.15   0.13   0.16   0.14   0.15   0.13   0.16   0.14   0.78   0.68   1.87   1.64
        industrial         0.20   0.18   0.20   0.18   0.20   0.18   0.20   0.18   0.20   0.18   0.20   0.18   0.20   0.18   0.20   0.18   0.20   0.18   0.20   0.18   0.20   0.18   0.20   0.18   1.01   0.91   2.43   2.18
        energy projects    0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        Avg. Generation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
        Avg. Irrigation     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    6.0    3.8   13.3    8.4   21.4   13.5   14.3    9.0   14.9    9.4    0.0    0.0    0.0    0.0    0.0    0.0   69.9   44.1   69.9   44.1
                         ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
        Total Demand        0.4    0.4    0.4    0.3    0.4    0.4    0.5    0.4    6.5    4.2   13.8    8.8   21.9   13.9   14.8    9.4   15.4    9.7    0.5    0.4    0.4    0.3    0.4    0.4   72.5   46.0   75.6   48.5
        Local Inflow        0.4           0.6          12.7          61.4          22.2           4.1          50.4          14.5          18.3           6.7           5.5           1.8         109.4         198.5
        Generatn Return     0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
        Irrigatn Return     0.0           0.0           0.0           0.0          21.1          50.7          83.2          57.6          57.9           0.0           0.0           0.0         270.6         270.6
        Groundwater         0.4           0.4           0.4           0.4           0.4           0.4           0.4           0.4           0.4           0.4           0.4           0.4           2.1           4.7
        Diversions          0.0           0.0          -4.7          -4.7          -8.5          -8.5          -8.5          -8.5          -4.7          -4.7           0.0           0.0         -38.7         -53.0
        Minimum Flows       0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
```

```
            Historical Simulation:  Demands & Avg. Flows (MCM)                Date: TEST RUN 25/03/88    Page:  3

Forecast Year:    1999                                  TEST RUN FOR USER MANUAL
Seasonal Months:  May  to  Sep  (inclusive)

                           Jan           Feb           Mar           Apr           May           Jun           Jul           Aug           Sep           Oct           Nov           Dec          Season        Annual
                     ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- ------------- -------------
                     intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum intake consum
                     ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
Node:  7
I.D.: BNDRY07
Name: Boundary Node 7
      domestic        0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      livestock       0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      industrial      0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      energy projects 0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      Avg. Generation  0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
      Avg. Irrigation  0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
                     ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
      Total Demand     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
      Local Inflow   244.5         238.7         373.6         466.8         893.1        1663.8        1334.0         811.2         474.1         475.1         318.8         270.9        5178.1        7562.3
      Generatn Return  0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Irrigatn Return  0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Groundwater      0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Diversions       0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Minimum Flows    0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Boundary Flows [illegible]     90.1         185.2         402.5         774.8        1258.6        1076.2         576.3         352.0         273.1         172.2         104.8        4037.9        5[illegible]2.8
Node:  8
I.D.: DUMMY08
Name: Dummy Node 8
      domestic        0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      livestock       0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      industrial      0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      energy projects 0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
      Avg. Generation  0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
      Avg. Irrigation  0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
                     ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
      Total Demand     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
      Local Inflow     0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Generatn Return  0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Irrigatn Return  0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Groundwater      0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Diversions       0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Minimum Flows    0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0
```

APPENDIX D13

SAMPLE OUTPUT

MODULE 8
Perform Historical Simulation

Detailed Results
(MODULE8.DTL)

```
File:  MODULE8.DTL
                   Historical Simulation:  Network Violations                    Date: TEST RUN 25/03/88     Page:  1

                                           TEST RUN FOR USER MANUAL

                                           with reservoir drawdowns & with consumption cutbacks
Forecast Year: 1990
Season Months:  May  to  Sep  (inclusive)

                  Supply  (MCM)                                                    Intake  (MCM)                                            Consumption  (MCM)                                  Outflow  Minimum          Shortage  (MCM)
                  -------------------------------------------------------------    ---------------------------------------------------     ---------------------------------------------     -------  -------          ----------------
Year  Month Node  Local  Upstream  Grwater  Diversn  Irrigtn Generatn  Reservr   Total  Domestic  Livestk  Industl  Irrigtn    Total    %  Domestic  Livestk  Industl  Irrigtn    Total    %     MCM      MCM   Flag  Consume  Boundry
----  ----- --  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  ------- ----  -------  -------  -------  -------  ------- ----  -------  -------  ----  -------  -------
1912   Jan   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  380      0.0      0.1      0.3      0.0      0.4  280      0.0      0.0   **.      0.2      0.0
1912   Jan   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  416      0.0      0.0      0.0      0.0      0.0  173      0.0      0.0   **.      0.0      0.0
1912   Feb   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  415      0.0      0.1      0.3      0.0      0.4  310      0.0      0.0   **.      0.2      0.0
1912   Feb   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  440      0.0      0.0      0.0      0.0      0.0  181      0.0      0.0   **.      0.0      0.0
1912   Mar   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  380      0.0      0.1      0.3      0.0      0.4  280      0.0      0.0   **.      0.2      0.0
1912   Mar   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  416      0.0      0.0      0.0      0.0      0.0  173      0.0      0.0   **.      0.0      0.0
1912   Jun   5      0.0      0.0      0.0     11.4      0.0      1.0      0.0     12.4      0.0      0.0      0.1     15.8     15.9  128      0.0      0.0      0.0     10.0     10.0   81      2.4      0.0   *..      0.0      0.0
1912   Sep   5      8.9      0.0      0.0      5.7      0.0      0.8      0.0     15.4      0.0      0.0      0.1     16.4     16.5  107      0.0      0.0      0.0     10.3     10.4   87      5.1      0.0   *..      0.0      0.0
1913   Jan   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  380      0.0      0.1      0.3      0.0      0.4  280      0.0      0.0   **.      0.2      0.0
1913   Jan   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  416      0.0      0.0      0.0      0.0      0.0  173      0.0      0.0   **.      0.0      0.0
1913   Feb   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  415      0.0      0.1      0.3      0.0      0.4  310      0.0      0.0   **.      0.2      0.0
1913   Feb   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  440      0.0      0.0      0.0      0.0      0.0  181      0.0      0.0   **.      0.0      0.0
1913   Mar   4      0.2      0.0      0.1      0.0      0.0      0.0      0.0      0.3      0.1      0.1      0.3      0.0      0.5  172      0.0      0.1      0.3      0.0      0.4  128      0.0      0.0   **.      0.1      0.0
1913   Sep   5      3.8      0.0      0.0      5.7      0.0      0.8      0.0     10.3      0.0      0.0      0.1     13.0     13.1  127      0.0      0.0      0.0      8.2      8.2   80      2.1      0.0   *..      0.0      0.0
1913   Dec   4      0.3      0.0      0.1      0.0      0.0      0.0      0.0      0.4      0.1      0.1      0.3      0.0      0.5  118      0.0      0.1      0.3      0.0      0.4   87      0.1      0.0   *..      0.0      0.0
1914   Jan   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  380      0.0      0.1      0.3      0.0      0.4  280      0.0      0.0   **.      0.2      0.0
1914   Jan   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  416      0.0      0.0      0.0      0.0      0.0  173      0.0      0.0   **.      0.0      0.0
1914   Feb   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  415      0.0      0.1      0.3      0.0      0.4  310      0.0      0.0   **.      0.2      0.0
1914   Feb   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  440      0.0      0.0      0.0      0.0      0.0  181      0.0      0.0   **.      0.0      0.0
1914   Jul   5      2.4      0.0      0.0     13.2      0.0      1.4      0.0     17.0      0.0      0.0      0.1     23.6     23.7  130      0.0      0.0      0.0     14.0     14.0   87      2.1      0.0   *..      0.0      0.0
1914   Sep   5      2.9      0.0      0.0      5.7      0.0      0.9      0.0      9.5      0.0      0.0      0.1     12.8     12.9  136      0.0      0.0      0.0      8.1      8.1   85      1.4      0.0   *..      0.0      0.0
1914   Dec   4      0.3      0.0      0.1      0.0      0.0      0.0      0.0      0.4      0.1      0.1      0.3      0.0      0.5  118      0.0      0.1      0.3      0.0      0.4   87      0.1      0.0   *..      0.0      0.0
1915   Jan   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  380      0.0      0.1      0.3      0.0      0.4  280      0.0      0.0   **.      0.2      0.0
1915   Jan   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  416      0.0      0.0      0.0      0.0      0.0  173      0.0      0.0   **.      0.0      0.0
1915   Feb   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  415      0.0      0.1      0.3      0.0      0.4  310      0.0      0.0   **.      0.2      0.0
1915   Feb   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  440      0.0      0.0      0.0      0.0      0.0  181      0.0      0.0   **.      0.0      0.0
1916   Jan   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  380      0.0      0.1      0.3      0.0      0.4  280      0.0      0.0   **.      0.2      0.0
1916   Jan   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  416      0.0      0.0      0.0      0.0      0.0  173      0.0      0.0   **.      0.0      0.0
1916   Feb   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  415      0.0      0.1      0.3      0.0      0.4  310      0.0      0.0   **.      0.2      0.0
1916   Feb   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  440      0.0      0.0      0.0      0.0      0.0  181      0.0      0.0   **.      0.0      0.0
1917   Feb   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  415      0.0      0.1      0.3      0.0      0.4  310      0.0      0.0   **.      0.2      0.0
1917   Feb   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  440      0.0      0.0      0.0      0.0      0.0  181      0.0      0.0   **.      0.0      0.0
1917   Jul   5      6.5      0.0      0.0     13.2      0.0      1.3      0.0     21.0      0.0      0.0      0.1     23.6     23.7  113      0.0      0.0      0.0     14.8     14.8   71      6.1      0.0   *..      0.0      0.0
1917   Sep   5      3.7      0.0      0.0      5.7      0.0      0.8      0.0     10.2      0.0      0.0      0.1     14.0     14.1  138      0.0      0.0      0.0      8.8      8.9   87      1.3      0.0   *..      0.0      0.0
1917   Oct   4      0.0      0.0      0.2      0.0      0.0      0.0      0.0      0.2      0.1      0.1      0.3      0.0      0.5  352      0.1      0.1      0.3      0.0      0.4  251      0.0      0.0   **.      0.2      0.0
1917   Oct   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  404      0.0      0.0      0.0      0.0      0.1  160      0.0      0.0   **.      0.0      0.0
1917   Dec   4      0.2      0.0      0.1      0.0      0.0      0.0      0.0      0.3      0.1      0.1      0.3      0.0      0.5  145      0.0      0.1      0.3      0.0      0.4  108      0.0      0.0   **.      0.0      0.0
1918   Jan   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  380      0.0      0.1      0.3      0.0      0.4  280      0.0      0.0   **.      0.2      0.0
1918   Jan   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  416      0.0      0.0      0.0      0.0      0.0  173      0.0      0.0   **.      0.0      0.0
1918   Feb   4      0.3      0.0      0.1      0.0      0.0      0.0      0.0      0.5      0.1      0.1      0.3      0.0      0.5  106      0.0      0.1      0.3      0.0      0.4   78      0.1      0.0   *..      0.0      0.0
1918   Jun   5      0.0      0.0      0.0     11.4      0.0      1.1      0.0     12.5      0.0      0.0      0.1     16.0     16.1  120      0.0      0.0      0.0     10.1     10.1   81      2.4      0.0   *..      0.0      0.0
1918   Jul   5      0.0      0.0      0.0     13.2      0.0      1.4      0.0     14.7      0.0      0.0      0.1     25.8     25.9  176      0.0      0.0      0.0     16.3     16.3  111      0.0      0.0   **.      1.6      0.0
1918   Sep   5      0.0      0.0      0.0      5.7      0.0      0.9      0.0      6.6      0.0      0.0      0.1     15.4     15.5  235      0.0      0.0      0.0      9.7      9.7  148      0.0      0.0   **.      3.1      0.0
1918   Dec   4      0.3      0.0      0.1      0.0      0.0      0.0      0.0      0.4      0.1      0.1      0.3      0.0      0.5  118      0.0      0.1      0.3      0.0      0.4   87      0.1      0.0   *..      0.0      0.0
1919   Jan   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1      0.1      0.1      0.3      0.0      0.5  380      0.0      0.1      0.3      0.0      0.4  280      0.0      0.0   **.      0.2      0.0
1919   Jan   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.1      0.0      0.1  416      0.0      0.0      0.0      0.0      0.0  173      0.0      0.0   **.      0.0      0.0
```

```
                 Historical Simulation:  Network Violations                                Date: TEST RUN 25/03/88     Page:  2

                                         TEST RUN FOR USER MANUAL

                                         with reservoir drawdowns & with consumption cutbacks
Forecast Year: 1999
Season Months:  May  to  Sep  (inclusive)

                   Supply  (MCM)                                                            Intake  (MCM)                                              Consumption  (MCM)                                    Outflow  Minimum          Shortage  (MCM)
                   --------------------------------------------------------------------     -----------------------------------------------------      ------------------------------------------------     -------  -------          ---------------
Year  Month Node   Local  Upstream  Grwater  Diversn  Irrigtn Generatn  Reservr    Total    Domestic  Livestk  Industl  Irrigtn    Total    %     Domestic  Livestk  Industl  Irrigtn    Total    %      MCM      MCM     Flag  Consume  Boundry
----  ----- --    -------  -------  -------  -------  ------- --------  -------  -------    -------   -------  -------  -------  -------  ----     -------   -------  -------  -------  -------  ----    -------  -------   ----  -------  -------
1919   Feb   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1        0.1       0.1      0.3      0.0      0.5  415         0.0       0.1      0.3      0.0      0.4  310        0.0      0.0    **.      0.2      0.0
1919   Feb   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0        0.0       0.0      0.1      0.0      0.1  449         0.0       0.0      0.0      0.0      0.0  181        0.0      0.0    **.      0.0      0.0
1919   Jun   5      0.0      0.0      0.0     11.4      0.0      1.2      0.0     12.6        0.0       0.0      0.1     16.0     16.1  128         0.0       0.0      0.0     10.1     10.1   80        2.5      0.0    *..      0.0      0.0
1919   Jul   5      0.0      0.0      0.0     13.2      0.0      1.5      0.0     14.8        0.0       0.0      0.1     20.6     20.7  140         0.0       0.0      0.0     13.0     13.0   88        1.8      0.0    *..      0.0      0.0
1919   Sep   5      3.0      0.0      0.0      5.7      0.0      0.8      0.0      9.7        0.0       0.0      0.1     11.2     11.3  117         0.0       0.0      0.0      7.1      7.1   74        2.6      0.0    *..      0.0      0.0
1919   Oct   4      0.0      0.0      0.2      0.0      0.0      0.0      0.0      0.2        0.1       0.1      0.3      0.0      0.5  352         0.1       0.1      0.3      0.0      0.4  251        0.0      0.0    **.      0.2      0.0
1919   Oct   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0        0.0       0.0      0.1      0.0      0.1  404         0.0       0.0      0.0      0.0      0.1  180        0.0      0.0    **.      0.0      0.0
1919   Nov   4      0.1      0.0      0.1      0.0      0.0      0.0      0.0      0.2        0.1       0.1      0.3      0.0      0.5  244         0.0       0.1      0.3      0.0      0.4  182        0.0      0.0    **.      0.2      0.0
1919   Nov   5      0.1      0.0      0.0      0.0      0.0      0.0      0.0      0.1        0.0       0.0      0.1      0.0      0.1  113         0.0       0.0      0.0      0.0      0.0   48        0.1      0.0    *..      0.0      0.0
1920   Sep   5      3.0      0.0      0.0      5.7      0.0      0.8      0.0      9.6        0.0       0.0      0.1     16.7     16.8  178         0.0       0.0      0.0     10.5     10.6  110        0.0      0.0    **.      1.0      0.0
1920   Dec   4      0.2      0.0      0.1      0.0      0.0      0.0      0.0      0.3        0.1       0.1      0.3      0.0      0.5  172         0.0       0.1      0.3      0.0      0.4  128        0.0      0.0    **.      0.1      0.0
1921   Jan   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1        0.1       0.1      0.3      0.0      0.5  380         0.0       0.1      0.3      0.0      0.4  288        0.0      0.0    **.      0.2      0.0
1921   Jan   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0        0.0       0.0      0.1      0.0      0.1  418         0.0       0.0      0.0      0.0      0.0  173        0.0      0.0    **.      0.0      0.0
1921   Feb   4      0.1      0.0      0.1      0.0      0.0      0.0      0.0      0.3        0.1       0.1      0.3      0.0      0.5  184         0.0       0.1      0.3      0.0      0.4  138        0.0      0.0    **.      0.1      0.0
1921   Jun   5      0.0      0.0      0.0     11.4      0.0      1.1      0.0     12.5        0.0       0.0      0.1     16.0     16.1  128         0.0       0.0      0.0     10.1     10.1   81        2.4      0.0    *..      0.0      0.0
1921   Jul   5      0.0      0.0      0.0     13.2      0.0      1.4      0.0     14.7        0.0       0.0      0.1     15.0     15.1  103         0.0       0.0      0.0      8.5      8.5   85        5.2      0.0    *..      0.0      0.0
1921   Sep   5      0.6      0.0      0.0      5.7      0.0      0.8      0.0      7.2        0.0       0.0      0.1      8.3      8.4  130         0.0       0.0      0.0      5.8      5.9   81        1.3      0.0    *..      0.0      0.0
1921   Oct   4      0.0      0.0      0.2      0.0      0.0      0.0      0.0      0.2        0.1       0.1      0.3      0.0      0.5  352         0.1       0.1      0.3      0.0      0.4  251        0.0      0.0    **.      0.2      0.0
1921   Oct   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0        0.0       0.0      0.1      0.0      0.1  404         0.0       0.0      0.0      0.0      0.1  180        0.0      0.0    **.      0.0      0.0
1921   Nov   4      0.1      0.0      0.1      0.0      0.0      0.0      0.0      0.2        0.1       0.1      0.3      0.0      0.5  244         0.0       0.1      0.3      0.0      0.4  182        0.0      0.0    **.      0.2      0.0
1921   Nov   5      0.1      0.0      0.0      0.0      0.0      0.0      0.0      0.1        0.0       0.0      0.1      0.0      0.1  113         0.0       0.0      0.0      0.0      0.0   48        0.1      0.0    *..      0.0      0.0
1921   Dec   4      0.0      0.0      0.1      0.0      0.0      0.0      0.0      0.1        0.1       0.1      0.3      0.0      0.5  380         0.0       0.1      0.3      0.0      0.4  288        0.0      0.0    **.      0.2      0.0
1921   Dec   5      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0        0.0       0.0      0.1      0.0      0.1  418         0.0       0.0      0.0      0.0      0.0  173        0.0      0.0    **.      0.0      0.0
```

APPENDIX D14

SAMPLE OUTPUT

MODULE 8
Perform Historical Simulation

Seasonal Summary
(MODULE8.SNL)

```
                  Historical Simulation:  Seasonal Results                          Date: TEST RUN 25/03/88     Page:  2
                                          TEST RUN FOR USER MANUAL

                                          with reservoir drawdowns & with consumption cutbacks
Forecast Year: 1990
Season Months:  May  to  Sep  (inclusive)

                   Supply  (MCM)                                                     Intake  (MCM)                                          Consumption  (MCM)                                         Outflow  Minimum          Shortage  (MCM)
                   -----------------------------------------------------------------  -----------------------------------------------------  -----------------------------------------------------  -------  -------          ----------------
Year  Month Mode  Local  Upstream  Grwater  Diversn  Irrigtn Generatn  Reservr   Total  Domestic  Livestk  Industl  Irrigtn   Total    %  Domestic  Livestk  Industl  Irrigtn   Total    %      MCM      MCM  Flag  Consume  Boundry
----  ----- --  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  ------- ----  -------  -------  -------  -------  ------- ----  -------  -------  ----  -------  -------
1917  Seasn  5     86.3   2070.0      2.1    -38.7    265.3      0.0      0.0   2385.0                                        77.9    3                                         48.4    2   2336.3      0.0  ...
1917  Seasn  7   6501.0   2336.3      0.0      0.0      0.0      0.0      0.0   8837.3                                         0.0    0                                          0.0    0   8837.3      0.0  ...
1917  Seasn  8      0.0   8837.3      0.0      0.0      0.0      0.0      0.0   8837.3                                         0.0    0                                          0.0    0   8837.3      0.0  ...

1918  Seasn  1    375.0      0.0      0.0      0.0      0.0      0.0      0.0    375.0                                         0.0    0                                          0.0    0    353.2      0.0  ...
1918  Seasn  2    404.5    353.2      4.1      0.0      0.0      0.0      0.0    761.8                                        13.2    2                                          5.6    1    756.3      0.0  ...
1918  Seasn  3      0.0    756.3      2.0    -26.4      0.0      0.0      0.0    731.9                                        15.1    2                                         11.3    2    720.5      0.0  ...
1918  Seasn  4      0.0      0.0      0.8      0.0     49.8      0.0      0.0     50.6                                         5.9   12                                          3.8    8     46.8      0.0  ...
1918  Seasn  5      0.0      0.0      0.2     53.0      0.0      5.6      0.0     58.8                                        76.0  129                                         47.8   81     15.0      0.0  *..
1918  Seasn  6      0.0    783.1      2.1    -38.7    294.7      0.0      0.0   1041.2                                        80.1    8                                         56.5    5    984.7      0.0  ...
1918  Seasn  7   3759.7    984.7      0.0      0.0      0.0      0.0      0.0   4744.4                                         0.0    0                                          0.0    0   4744.4      0.0  ...
1918  Seasn  8      0.0   4744.4      0.0      0.0      0.0      0.0      0.0   4744.4                                         0.0    0                                          0.0    0   4744.4      0.0  ...

1919  Seasn  1    303.0      0.0      0.0      0.0      0.0      0.0      0.0    303.0                                         0.0    0                                          0.0    0    211.5      0.0  ...
1919  Seasn  2    327.1    211.5      4.1      0.0      0.0      0.0      0.0    542.7                                        12.0    2                                          5.5    1    537.3      0.0  ...
1919  Seasn  3     43.2    537.3      2.0    -26.4      0.0      0.0      0.0    556.1                                        15.1    3                                         11.5    2    544.6      0.0  ...
1919  Seasn  4     11.7      0.0      0.8      0.0     46.0      0.0      0.0     58.5                                         5.7   10                                          3.7    6     54.8      0.0  ...
1919  Seasn  5     12.2      0.0      0.2     53.0      0.0      6.2      0.0     71.5                                        70.9   99                                         44.5   62     27.0      0.0  ...
1919  Seasn  6     40.6    626.3      2.1    -38.7    252.5      0.0      0.0    882.7                                        83.3    9                                         52.8    6    830.0      0.0  ...
1919  Seasn  7   3325.4    830.0      0.0      0.0      0.0      0.0      0.0   4155.3                                         0.0    0                                          0.0    0   4155.3      0.0  ...
1919  Seasn  8      0.0   4155.3      0.0      0.0      0.0      0.0      0.0   4155.3                                         0.0    0                                          0.0    0   4155.3      0.0  ...

1920  Seasn  1    707.0      0.0      0.0      0.0      0.0      0.0      0.0    707.0                                         0.0    0                                          0.0    0    588.7      0.0  ...
1920  Seasn  2    762.0    588.7      4.1      0.0      0.0      0.0      0.0   1355.8                                        13.0    1                                          5.5    0   1350.3      0.0  ...
1920  Seasn  3    227.2   1350.3      2.0    -26.4      0.0      0.0      0.0   1553.1                                        14.6    1                                         11.0    1   1542.1      0.0  ...
1920  Seasn  4     61.4      0.0      0.8      0.0     46.5      0.0      0.0    108.8                                         5.6    5                                          3.7    3    105.1      0.0  ...
1920  Seasn  5     64.2      0.0      0.2     53.0      0.0      5.6      0.0    123.0                                        70.6   57                                         43.7   36     79.3      0.0  ...
1920  Seasn  6    213.7   1727.4      2.1    -38.7    307.7      0.0      0.0   2212.2                                        81.8    4                                         51.8    2   2160.4      0.0  ...
1920  Seasn  7   5190.1   2160.4      0.0      0.0      0.0      0.0      0.0   7350.5                                         0.0    0                                          0.0    0   7350.5      0.0  ...
1920  Seasn  8      0.0   7350.5      0.0      0.0      0.0      0.0      0.0   7350.5                                         0.0    0                                          0.0    0   7350.5      0.0  ...

1921  Seasn  1    320.4      0.0      0.0      0.0      0.0      0.0      0.0    320.4                                         0.0    0                                          0.0    0    211.5      0.0  ...
1921  Seasn  2    353.7    211.5      4.1      0.0      0.0      0.0      0.0    569.3                                        12.5    2                                          5.2    1    564.1      0.0  ...
1921  Seasn  3      2.3    564.1      2.0    -26.4      0.0      0.0      0.0    542.0                                        13.8    3                                         10.6    2    531.5      0.0  ...
1921  Seasn  4      0.6      0.0      0.8      0.0     39.9      0.0      0.0     41.4                                         5.3   13                                          3.5    8     37.9      0.0  ...
1921  Seasn  5      0.6      0.0      0.2     53.0      0.0      5.6      0.0     59.5                                        57.8   97                                         36.3   61     23.2      0.0  ...
1921  Seasn  6      2.2    582.5      2.1    -38.7    280.3      0.0      0.0    828.4                                        68.2    8                                         43.3    5    785.1      0.0  ...
1921  Seasn  7   4059.9    785.1      0.0      0.0      0.0      0.0      0.0   4845.0                                         0.0    0                                          0.0    0   4845.0      0.0  ...
1921  Seasn  8      0.0   4845.0      0.0      0.0      0.0      0.0      0.0   4845.0                                         0.0    0                                          0.0    0   4845.0      0.0  ...
```

```
file:  MODULE8.SML
                 Historical Simulation:  Seasonal Results                              Date: TEST RUN 25/03/88     Page:  1
                                         TEST RUN FOR USER MANUAL

                                         with reservoir drawdowns & with consumption cutbacks
Forecast Year: 1990
Season Months:  May  to  Sep  (inclusive)

                    Supply  (MCM)                                                              Intake  (MCM)                                          Consumption  (MCM)                                       Outflow  Minimum          Shortage  (MCM)
                    ----------------------------------------------------------------------    ----------------------------------------------------    ---------------------------------------------------    -------  -------          ---------------
Year  Month Node   Local  Upstream  Grwater  Diversn  Irrigtn Generatn  Reservr    Total    Domestic  Livestk  Industl  Irrigtn    Total    %    Domestic  Livestk  Industl  Irrigtn    Total    %      MCM      MCM     Flag  Consume  Boundry
----  ----- --   -------  -------   -------  -------  -------  -------  -------  -------    -------   -------  -------  -------  -------  ---    -------   -------  -------  -------  -------  ---   -------  -------    ----  -------  -------
1912  Seasn  1     885.0      0.0      0.0      0.0      0.0      0.0      0.0    885.0                                              0.0    0                                               0.0    0    867.2      0.0    ...
1912  Seasn  2    1071.0    867.2      4.1      0.0      0.0      0.0      0.0   1942.3                                             13.0    1                                               5.5    0   1936.8      0.0    ...
1912  Seasn  3     158.0   1936.8      2.0    -28.4      0.0      0.0      0.0   2070.4                                             14.3    1                                              10.7    1   2059.7      0.0    ...
1912  Seasn  4      42.7      0.0      0.8      0.0     46.4      0.0      0.0     90.0                                              5.7    6                                               3.8    4     86.3      0.0    ...
1912  Seasn  5      44.6      0.0      0.2     53.0      0.0      5.1      0.0    102.9                                             60.4   67                                              43.6   42     59.3      0.0    ...
1912  Seasn  6     148.4   2205.3      2.1    -38.7    280.0      0.0      0.0   2597.0                                             81.5    3                                              51.7    2   2545.3      0.0    ...
1912  Seasn  7    4632.9   2545.3      0.0      0.0      0.0      0.0      0.0   7178.2                                              0.0    0                                               0.0    0   7178.2      0.0    ...
1912  Seasn  8       0.0   7178.2      0.0      0.0      0.0      0.0      0.0   7178.2                                              0.0    0                                               0.0    0   7178.2      0.0    ...

1913  Seasn  1     800.2      0.0      0.0      0.0      0.0      0.0      0.0    800.2                                              0.0    0                                               0.0    0    687.5      0.0    ...
1913  Seasn  2     752.7    687.5      4.1      0.0      0.0      0.0      0.0   1444.3                                             12.5    1                                               5.2    0   1439.1      0.0    ...
1913  Seasn  3      58.0   1439.1      2.0    -28.4      0.0      0.0      0.0   1472.7                                             13.3    1                                              10.1    1   1462.7      0.0    ...
1913  Seasn  4      15.7      0.0      0.8      0.0     39.9      0.0      0.0     56.4                                              5.2    9                                               3.5    6     52.9      0.0    ...
1913  Seasn  5      16.4      0.0      0.2     53.0      0.0      5.1      0.0     74.6                                             58.5   78                                              36.7   48     37.9      0.0    ...
1913  Seasn  6      54.8   1553.5      2.1    -38.7    291.1      0.0      0.0   1862.8                                             60.0    4                                              43.8    2   1818.7      0.0    ...
1913  Seasn  7    5165.4   1818.7      0.0      0.0      0.0      0.0      0.0   6984.1                                              0.0    0                                               0.0    0   6984.1      0.0    ...
1913  Seasn  8       0.0   6984.1      0.0      0.0      0.0      0.0      0.0   6984.1                                              0.0    0                                               0.0    0   6984.1      0.0    ...

1914  Seasn  1     371.8      0.0      0.0      0.0      0.0      0.0      0.0    371.8                                              0.0    0                                               0.0    0    231.1      0.0    ...
1914  Seasn  2     400.4    231.1      4.1      0.0      0.0      0.0      0.0    635.6                                             12.8    2                                               5.4    1    630.2      0.0    ...
1914  Seasn  3      31.8    630.2      2.0    -28.4      0.0      0.0      0.0    637.7                                             14.3    2                                              10.8    2    626.8      0.0    ...
1914  Seasn  4       8.8      0.0      0.8      0.0     43.4      0.0      0.0     52.0                                              5.5   10                                               3.8    7     48.2      0.0    ...
1914  Seasn  5       8.1      0.0      0.2     53.0      0.0      5.6      0.0     67.0                                             65.8   97                                              41.4   61     26.5      0.0    ...
1914  Seasn  6      30.0    702.6      2.1    -38.7    306.6      0.0      0.0   1002.6                                             77.4    8                                              49.1    5    953.5      0.0    ...
1914  Seasn  7    4034.5    953.5      0.0      0.0      0.0      0.0      0.0   4988.0                                              0.0    0                                               0.0    0   4988.0      0.0    ...
1914  Seasn  8       0.0   4988.0      0.0      0.0      0.0      0.0      0.0   4988.0                                              0.0    0                                               0.0    0   4988.0      0.0    ...

1915  Seasn  1    1846.0      0.0      0.0      0.0      0.0      0.0      0.0   1846.0                                              0.0    0                                               0.0    0   1510.5      0.0    ...
1915  Seasn  2    1771.5   1510.5      4.1      0.0      0.0      0.0      0.0   3285.2                                             12.0    0                                               4.8    0   3280.4      0.0    ...
1915  Seasn  3     343.8   3280.4      2.0    -28.4      0.0      0.0      0.0   3608.5                                             11.8    0                                               8.2    0   3600.4      0.0    ...
1915  Seasn  4      93.0      0.0      0.8      0.0     28.7      0.0      0.0    122.5                                              4.5    4                                               3.0    2    119.5      0.0    ...
1915  Seasn  5      97.1      0.0      0.2     53.0      0.0      5.1      0.0    155.3                                             35.4   23                                              22.2   14    133.1      0.0    ...
1915  Seasn  6     322.8   3853.0      2.1    -38.7    199.5      0.0      0.0   4338.7                                             42.5    1                                              27.1    1   4311.6      0.0    ...
1915  Seasn  7    6834.5   4311.6      0.0      0.0      0.0      0.0      0.0  11146.1                                              0.0    0                                               0.0    0  11146.1      0.0    ...
1915  Seasn  8       0.0  11146.1      0.0      0.0      0.0      0.0      0.0  11146.1                                              0.0    0                                               0.0    0  11146.1      0.0    ...

1916  Seasn  1    1375.8      0.0      0.0      0.0      0.0      0.0      0.0   1375.8                                              0.0    0                                               0.0    0   1318.1      0.0    ...
1916  Seasn  2    1480.8   1318.1      4.1      0.0      0.0      0.0      0.0   2803.0                                             12.3    0                                               5.1    0   2798.0      0.0    ...
1916  Seasn  3     208.0   2798.0      2.0    -28.4      0.6      0.0      0.0   2981.6                                             12.8    0                                               9.7    0   2971.8      0.0    ...
1916  Seasn  4      56.2      0.0      0.8      0.0     34.3      0.0      0.0     91.3                                              5.0    5                                               3.3    4     88.0      0.0    ...
1916  Seasn  5      58.8      0.0      0.2     53.0      0.0      5.1      0.0    117.0                                             45.3   38                                              28.4   24     88.6      0.0    ...
1916  Seasn  6     195.6   3148.3      2.1    -38.7    228.8      0.0      0.0   3536.2                                             53.8    2                                              34.2    1   3501.9      0.0    ...
1916  Seasn  7    8158.9   3501.9      0.0      0.0      0.0      0.0      0.0  11660.8                                              0.0    0                                               0.0    0  11660.8      0.0    ...
1916  Seasn  8       0.0  11660.8      0.0      0.0      0.0      0.0      0.0  11660.8                                              0.0    0                                               0.0    0  11660.8      0.0    ...

1917  Seasn  1     821.7      0.0      0.0      0.0      0.0      0.0      0.0    821.7                                              0.0    0                                               0.0    0    815.2      0.0    ...
1917  Seasn  2     991.9    815.2      4.1      0.0      0.0      0.0      0.0   1811.3                                             12.7    1                                               5.3    0   1805.9      0.0    ...
1917  Seasn  3      92.0   1805.9      2.0    -28.4      0.0      0.0      0.0   1873.5                                             13.9    1                                              10.4    1   1863.1      0.0    ...
1917  Seasn  4      24.8      0.0      0.8      0.0     43.2      0.0      0.0     68.9                                              5.5    8                                               3.7    5     65.2      0.0    ...
1917  Seasn  5      25.9      0.0      0.2     53.0      0.0      5.1      0.0     84.2                                             66.2   79                                              41.6   49     42.6      0.0    ...
```

APPENDIX D15

SAMPLE OUTPUT

MODULE 8
Perform Historical Simulation

Annual Summary
(MODULE8.ANL)

```
file:  MODULE8.ANL
                    Historical Simulation:  Annual Results                               Date: TEST RUN 25/03/88      Page:  1
                                            TEST RUN FOR USER MANUAL

                                            with reservoir drawdowns & with consumption cutbacks
 Forecast Year:  1999
 Season Months:  May  to  Sep  (inclusive)

                    Supply  (MCM)                                                           Intake  (MCM)                                          Consumption  (MCM)                                        Outflow  Minimum          Shortage  (MCM)
                    -----------------------------------------------------------------------  ---------------------------------------------------  ------------------------------------------------------  -------  -------          ---------------
 Year  Month Node   Local  Upstream  Grwater  Diversn  Irrigtn Generatn  Reservr    Total  Domestic  Livestk  Industl  Irrigtn    Total    %  Domestic  Livestk  Industl  Irrigtn    Total    %     MCM      MCM     Flag Consume  Boundry
 ----  ----- --  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  ---  -------  -------  -------  -------  -------  ---  -------  -------  ---- -------  -------
 1912  Anual  1   1263.4      0.0      0.0      0.0      0.0      0.0      0.0   1263.4                                          0.0    0                                          0.0    0   1218.2      0.0  ...
 1912  Anual  2   1360.3   1218.2      8.7      0.0      0.0      0.0      0.0   2587.2                                         22.0    1                                          9.6    0   2577.6      0.0  ...
 1912  Anual  3    235.1   2577.6      4.3    -37.0      0.0      0.0      0.0   2780.0                                         25.8    1                                         20.7    1   2750.4      0.0  ...
 1912  Anual  4     63.5      0.0      1.8      0.0     46.4      0.0      0.0    111.8                                          8.3    8                                          6.4    6    106.2      0.0  ...
 1912  Anual  5     66.5      0.0      0.4     53.0      0.0      5.1      0.0    124.9                                         70.2   56                                         43.8   35     81.0      0.0  ...
 1912  Anual  6    220.8   2946.5      4.7    -53.0    280.0      0.0      0.0   3399.0                                         84.7    2                                         54.2    2   3344.8      0.0  ...
 1912  Anual  7   7061.2   3344.8      0.0      0.0      0.0      0.0      0.0  10406.0                                          0.0    0                                          0.0    0  10406.0      0.0  ...
 1912  Anual  8      0.0  10406.0      0.0      0.0      0.0      0.0      0.0  10406.0                                          0.0    0                                          0.0    0  10406.0      0.0  ...

 1913  Anual  1    985.4      0.0      0.0      0.0      0.0      0.0      0.0    985.4                                          0.0    0                                          0.0    0    981.3      0.0  ...
 1913  Anual  2   1030.7    981.3      8.7      0.0      0.0      0.0      0.0   2020.7                                         22.5    1                                          0.3    0   2020.4      0.0  ...
 1913  Anual  3    146.1   2020.4      4.3    -37.0      0.0      0.0      0.0   2133.8                                         24.8    1                                         20.1    1   2113.8      0.0  ...
 1913  Anual  4     39.6      0.0      1.8      0.0     39.8      0.0      0.0     81.2                                          8.8   11                                          6.1    7     75.7      0.0  ...
 1913  Anual  5     41.3      0.0      0.4     53.0      0.0      5.1      0.0     99.7                                         58.3   60                                         37.1   37     62.7      0.0  ...
 1913  Anual  6    137.2   2252.2      4.7    -53.0    291.1      0.0      0.0   2632.2                                         72.2    3                                         46.3    2   2585.0      0.0  ...
 1913  Anual  7   7565.5   2585.9      0.0      0.0      0.0      0.0      0.0  10151.4                                          0.0    0                                          0.0    0  10151.4      0.0  ...
 1913  Anual  8      0.0  10151.4      0.0      0.0      0.0      0.0      0.0  10151.4                                          0.0    0                                          0.0    0  10151.4      0.0  ...

 1914  Anual  1    520.5      0.0      0.0      0.0      0.0      0.0      0.0    520.5                                          0.0    0                                          0.0    0    520.9      0.0  ...
 1914  Anual  2    578.6    520.9      8.7      0.0      0.0      0.0      0.0   1108.2                                         22.8    2                                          8.5    1   1099.7      0.0  ...
 1914  Anual  3     74.7   1099.7      4.3    -37.0      0.0      0.0      0.0   1141.7                                         26.5    2                                         21.5    2   1120.1      0.0  ...
 1914  Anual  4     20.2      0.0      1.8      0.0     43.4      0.0      0.0     65.4                                          9.0   14                                          6.2   10     58.8      0.0  ...
 1914  Anual  5     21.2      0.0      0.4     53.0      0.0      5.6      0.0     80.2                                         66.7   83                                         41.7   52     38.6      0.0  ...
 1914  Anual  6     70.1   1218.4      4.7    -53.0    306.6      0.0      0.0   1546.8                                         80.6    5                                         51.8    3   1495.2      0.0  ...
 1914  Anual  7   6573.0   1495.2      0.0      0.0      0.0      0.0      0.0   8068.2                                          0.0    0                                          0.0    0   8068.2      0.0  ...
 1914  Anual  8      0.0   8068.2      0.0      0.0      0.0      0.0      0.0   8068.2                                          0.0    0                                          0.0    0   8068.2      0.0  ...

 1915  Anual  1   1880.6      0.0      0.0      0.0      0.0      0.0      0.0   1880.6                                          0.0    0                                          0.0    0   1877.3      0.0  ...
 1915  Anual  2   2045.0   1877.3      8.7      0.0      0.0      0.0      0.0   3931.0                                         21.8    1                                          8.9    0   3922.1      0.0  ...
 1915  Anual  3    422.8   3922.1      4.3    -37.0      0.0      0.0      0.0   4312.3                                         23.5    1                                         18.2    0   4293.1      0.0  ...
 1915  Anual  4    114.4      0.0      1.8      0.0     28.7      0.0      0.0    144.9                                          8.1    6                                          5.8    4    139.0      0.0  ...
 1915  Anual  5    118.5      0.0      0.4     53.0      0.0      5.1      0.0    177.0                                         36.3   20                                         22.5   13    155.4      0.0  ...
 1915  Anual  6    397.2   4588.3      4.7    -53.0    199.5      0.0      0.0   5136.6                                         45.7    1                                         28.8    1   5107.0      0.0  ...
 1915  Anual  7   9451.5   5107.0      0.0      0.0      0.0      0.0      0.0  14558.5                                          0.0    0                                          0.0    0  14558.5      0.0  ...
 1915  Anual  8      0.0  14558.5      0.0      0.0      0.0      0.0      0.0  14558.5                                          0.0    0                                          0.0    0  14558.5      0.0  ...

 1916  Anual  1   1728.6      0.0      0.0      0.0      0.0      0.0      0.0   1728.6                                          0.0    0                                          0.0    0   1715.3      0.0  ...
 1916  Anual  2   1860.0   1715.3      8.7      0.0      0.0      0.0      0.0   3584.0                                         22.2    1                                          8.1    0   3575.7      0.0  ...
 1916  Anual  3    412.0   3575.7      4.3    -37.0      0.0      0.0      0.0   3954.0                                         24.4    1                                         18.7    0   3935.2      0.0  ...
 1916  Anual  4    111.3      0.0      1.8      0.0     34.3      0.0      0.0    147.4                                          8.5    6                                          5.6    4    141.8      0.0  ...
 1916  Anual  5    116.3      0.0      0.4     53.0      0.0      5.1      0.0    174.8                                         46.1   26                                         28.7   16    146.1      0.0  ...
 1916  Anual  6    387.2   4223.2      4.7    -53.0    228.8      0.0      0.0   4790.9                                         57.0    1                                         36.7    1   4754.2      0.0  ...
 1916  Anual  7  11648.1   4754.2      0.0      0.0      0.0      0.0      0.0  16402.2                                          0.0    0                                          0.0    0  16402.2      0.0  ...
 1916  Anual  8      0.0  16402.2      0.0      0.0      0.0      0.0      0.0  16402.2                                          0.0    0                                          0.0    0  16402.2      0.0  ...

 1917  Anual  1   1231.0      0.0      0.0      0.0      0.0      0.0      0.0   1231.0                                          0.0    0                                          0.0    0   1244.6      0.0  ...
 1917  Anual  2   1325.3   1244.6      8.7      0.0      0.0      0.0      0.0   2578.7                                         22.7    1                                          8.4    0   2569.2      0.0  ...
 1917  Anual  3    177.0   2569.2      4.3    -37.0      0.0      0.0      0.0   2713.5                                         25.5    1                                         20.4    1   2693.1      0.0  ...
 1917  Anual  4     47.8      0.0      1.8      0.0     43.2      0.0      0.0     92.8                                          9.1   10                                          6.3    7     87.1      0.0  ...
 1917  Anual  5     49.8      0.0      0.4     53.0      0.0      5.1      0.0    108.3                                         67.1   62                                         42.0   39     66.4      0.0  ...
```

```
                  Historical Simulation:  Annual Results                            Date: TEST RUN 25/03/88     Page:  2

                                          TEST RUN FOR USER MANUAL

                                          with reservoir drawdowns & with consumption cutbacks
Forecast Year: 1999
Season Months:  May  to  Sep  (inclusive)

                  Supply  (MCM)                                                                Intake  (MCM)                                                Consumption  (MCM)                                           Outflow  Minimum         Shortage  (MCM)
                  -------------------------------------------------------------------------    -------------------------------------------------------    -------------------------------------------------------    -------  -------         ----------------
Year  Month Mode  Local  Upstream  Grwater  Diversn  Irrigtn Generatn  Reservr    Total  Domestic  Livestk  Industl  Irrigtn    Total    %  Domestic  Livestk  Industl  Irrigtn    Total    %      MCM      MCM  Flag  Consume  Boundry
----  ----- --  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  ----  -------  -------  -------  -------  -------  ----  -------  -------  ----  -------  -------
1917  Anual  6    166.2   2846.5      4.7    -53.0    265.3      0.0      0.0   3220.7                                          81.1     3                                         51.9     2   3177.8      0.0   ...
1917  Anual  7   8829.5   3177.8      0.0      0.0      0.0      0.0      0.0  12007.3                                           0.0     0                                          0.0     0  12007.3      0.0   ...
1917  Anual  8      0.0  12007.3      0.0      0.0      0.0      0.0      0.0  12007.3                                           0.0     0                                          0.0     0  12007.3      0.0   ...

1918  Anual  1    620.8      0.0      0.0      0.0      0.0      0.0      0.0    620.8                                           0.0     0                                          0.0     0    646.3      0.0   ...
1918  Anual  2    668.8    646.3      8.7      0.0      0.0      0.0      0.0   1323.8                                          23.1     2                                          9.7     1   1314.1      0.0   ...
1918  Anual  3     83.6   1314.1      4.3    -37.0      0.0      0.0      0.0   1365.0                                          27.3     2                                         22.0     2   1343.0      0.0   ...
1918  Anual  4     22.6      0.0      1.8      0.0     49.8      0.0      0.0     74.2                                           9.4    13                                          6.5     9     68.0      0.0   ...
1918  Anual  5     23.6      0.0      0.4     53.0      0.0      5.6      0.0     82.6                                          76.8    93                                         48.1    58     30.3      0.0   ...
1918  Anual  6     78.7   1450.3      4.7    -53.0    294.7      0.0      0.0   1775.4                                          92.2     5                                         58.9     3   1716.4      0.0   ...
1918  Anual  7   5965.9   1716.4      0.0      0.0      0.0      0.0      0.0   7682.3                                           0.0     0                                          0.0     0   7682.3      0.0   ...
1918  Anual  8      0.0   7682.3      0.0      0.0      0.0      0.0      0.0   7682.3                                           0.0     0                                          0.0     0   7682.3      0.0   ...

1919  Anual  1    434.0      0.0      0.0      0.0      0.0      0.0      0.0    434.0                                           0.0     0                                          0.0     0    504.6      0.0   ...
1919  Anual  2    467.8    504.6      8.7      0.0      0.0      0.0      0.0    981.1                                          22.9     2                                          9.5     1    971.5      0.0   ...
1919  Anual  3    108.2    971.5      4.3    -37.0      0.0      0.0      0.0   1047.0                                          28.0     3                                         22.8     2   1024.2      0.0   ...
1919  Anual  4     29.2      0.0      1.8      0.0     46.0      0.0      0.0     77.0                                           9.2    12                                          6.3     8     71.6      0.0   ...
1919  Anual  5     30.6      0.0      0.4     53.0      0.0      6.2      0.0     90.1                                          71.7    80                                         44.8    50     45.3      0.0   ...
1919  Anual  6    101.8   1141.0      4.7    -53.0    252.5      0.0      0.0   1447.0                                          86.4     6                                         55.3     4   1391.7      0.0   ...
1919  Anual  7   5060.1   1391.7      0.0      0.0      0.0      0.0      0.0   6451.8                                           0.0     0                                          0.0     0   6451.8      0.0   ...
1919  Anual  8      0.0   6451.8      0.0      0.0      0.0      0.0      0.0   6451.8                                           0.0     0                                          0.0     0   6451.8      0.0   ...

1920  Anual  1    881.3      0.0      0.0      0.0      0.0      0.0      0.0    881.3                                           0.0     0                                          0.0     0    840.0      0.0   ...
1920  Anual  2    949.1    840.0      8.7      0.0      0.0      0.0      0.0   1797.8                                          22.9     1                                          9.6     1   1788.2      0.0   ...
1920  Anual  3    375.4   1788.2      4.3    -37.0      0.0      0.0      0.0   2130.9                                          26.8     1                                         21.7     1   2109.2      0.0   ...
1920  Anual  4    101.4      0.0      1.8      0.0     46.5      0.0      0.0    149.7                                           9.2     6                                          6.3     4    143.4      0.0   ...
1920  Anual  5    106.1      0.0      0.4     53.0      0.0      5.6      0.0    165.1                                          70.5    43                                         44.1    27    122.1      0.0   ...
1920  Anual  6    352.8   2374.7      4.7    -53.0    307.7      0.0      0.0   2986.8                                          85.0     3                                         54.3     2   2932.5      0.0   ...
1920  Anual  7   7431.7   2932.5      0.0      0.0      0.0      0.0      0.0  10364.3                                           0.0     0                                          0.0     0  10364.3      0.0   ...
1920  Anual  8      0.0  10364.3      0.0      0.0      0.0      0.0      0.0  10364.3                                           0.0     0                                          0.0     0  10364.3      0.0   ...

1921  Anual  1    470.8      0.0      0.0      0.0      0.0      0.0      0.0    470.8                                           0.0     0                                          0.0     0    490.9      0.0   ...
1921  Anual  2    507.6    490.9      8.7      0.0      0.0      0.0      0.0   1007.1                                          22.5     2                                          9.3     1    997.8      0.0   ...
1921  Anual  3     78.0    997.8      4.3    -37.0      0.0      0.0      0.0   1043.1                                          26.1     2                                         21.2     2   1021.9      0.0   ...
1921  Anual  4     21.1      0.0      1.8      0.0     39.9      0.0      0.0     62.8                                           8.8    14                                          6.1    10     57.8      0.0   ...
1921  Anual  5     22.0      0.0      0.4     53.0      0.0      5.6      0.0     81.1                                          58.6    72                                         36.6    45     44.5      0.0   ...
1921  Anual  6     73.6   1124.2      4.7    -53.0    280.3      0.0      0.0   1429.7                                          71.3     5                                         45.8     3   1383.9      0.0   ...
1921  Anual  7   6036.5   1383.9      0.0      0.0      0.0      0.0      0.0   7420.4                                           0.0     0                                          0.0     0   7420.4      0.0   ...
1921  Anual  8      0.0   7420.4      0.0      0.0      0.0      0.0      0.0   7420.4                                           0.0     0                                          0.0     0   7420.4      0.0   ...
```

APPENDIX D16

SAMPLE OUTPUT

MODULE 8
Perform Historical Simulation

Basin Network
(MODULE8.NET)

```
file:  MODULE8.NET

               Network Layout                                          Date: TEST RUN 25/03/88      Page:  1

     RESERVOIR   LOCATION
        NO.      NODE NO.
     ---------   --------
         1          1

     NODE  # UPSTREAM  RESERVOIR
      NO.  RESERVOIRS  NUMBERS
     ----  ----------  ---  ---  ---  ---  ---
       1       0
       2       1        1
       3       1        1
       4       0
       5       0
       6       1        1
       7       1        1
       8       0

     CHANNEL   NUMBER   NODE
       NO.    OF NODES  NUMBERS
     -------  --------  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
        1         6      1   2   3   6   7   8
        2         4      4   6   7   8
        3         4      5   6   7   8

     NODE  # UPSTREAM  NODE
      NO.   NODES (*)  NUMBERS
     ----  ----------  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
       1       0
       2       1        1
       3       2        2   1
       4       0
       5       0
       6       5        3   2   1   4   5
       7       6        6   3   2   1   4   5
       8       0

     *  in the same province.

     BOUNDARY  # NODES IN  NODE
     NODE NO.   PROVINCE   NUMBERS
     --------  ----------  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
         7          7       7   6   3   2   1   4   5
```

APPENDIX D17

SAMPLE OUTPUT

MODULE 8
Perform Historical Simulation

Reservoir Operations
(MODULE8.RES)

```
file:  MODULE8.RES

              Reservoir Data (with flows converted to volumes)                    Date: TEST RUN 25/03/88     Page:  1

                                      TEST RUN FOR USER MANUAL

                                           Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
                                       ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
  Reservoir:  1   Node:  1
  ------------------------

  Reservoir No. 1
  Level   - full supply (m):     951.000
          - evaluation  (m):               949.500    949.500    949.500    949.500    949.500    949.500    949.500    949.500    949.500    949.500    949.500    949.500
          - upper r.c.  (m):               948.000    948.000    948.000    948.000    948.000    948.000    948.000    948.000    948.000    948.000    948.000    948.000
          - evaluation  (m):               944.000    941.500    939.000    939.000    941.500    944.000    946.500    946.500    946.500    946.500    946.500    946.500
          - lower r.c.  (m):               940.000    935.000    930.000    930.000    935.000    940.000    945.000    945.000    945.000    945.000    945.000    945.000
          - evaluation  (m):               933.000    930.500    928.000    928.000    930.500    933.000    935.500    935.500    935.500    935.500    935.500    935.500
          - min. supply (m):     928.000
  Outflow- maximum    (MCM):              1339.200   1209.600   1339.200   1296.000   1339.200   1296.000   1339.200   1339.200   1296.000   1339.200   1296.000   1339.200
          - evaluation  (m):               691.027    624.154    691.027    668.736    691.027    668.736    691.027    691.027    668.736    691.027    668.736    691.027
          - target    (MCM):                42.854     38.707     42.854     41.472     42.854     41.472     42.854     42.854     41.472     42.854     41.472     42.854
          - evaluation  (m):                42.854     38.707     42.854     41.472     42.854     41.472     42.854     42.854     41.472     42.854     41.472     42.854
          - minimum   (MCM):                42.854     38.707     42.854     41.472     42.854     41.472     42.854     42.854     41.472     42.854     41.472     42.854


  NODE  RESERVOIR  STARTING
  NO.     INDEX     LEVEL
  ----  ---------  --------
   1        1        944.0
```

```
                 Historical Simulation:  Reservoir Violations                         Date: TEST RUN 25/03/88     Page:  1

                                          TEST RUN FOR USER MANUAL

                                          with reservoir drawdowns & with consumption cutbacks
Forecast Year: 1999
Season Months:  May  to  Sep  (inclusive)

                    Starting                            Evaporation     Elevation      Rule Curve     Outflow Constraints        Ending                                     Shortage       Extra
                 --------------                        -------------   ------------   ------------   ----  ----------------   --------------                               -------------   Volume
 Year  Month Res.  Elevn   Volume        Inflow          Net   Volume    Min.   Max.   Lower  Upper  Minimum  Target Maximum   Elevn . Volume       Outflow       Flag   Node   Volume  Released
 ----  ----- ----  -----  -------    --------  ------   -----  ------   -----  -----  -----  -----  -------  ------- -------   -----  -------   --------  ------   ----   ----  -------  -------
                    mm      MCM        MCM      cms      mm      MCM      m      m      m      m      MCM      MCM     MCM       m      MCM        MCM      cms                    MCM      MCM

 1918   Dec    1   946.0  178.250    10.017     3.7    -22.0  -0.316   926.0  951.0  945.0  948.0   42.854   42.854 1339.200   944.0  145.720    42.854    16.0   !...
 1919   Jul    1   941.8  120.803    50.274    18.8     98.0   1.138   926.0  951.0  945.0  948.0   42.854   42.854 1339.200   942.4  127.084    42.854    16.0   !...
 1919   Aug    1   942.4  127.084    72.745    27.2    101.0   1.298   926.0  951.0  945.0  948.0   42.854   42.854 1339.200   944.7  155.677    42.854    16.0   !...
 1919   Sep    1   944.7  155.677    40.798    15.7     59.0   0.822   926.0  951.0  945.0  948.0   41.472   41.472 1296.000   944.6  154.181    41.472    16.0   !...
 1919   Oct    1   944.6  154.180    24.106     9.0     64.0   0.836   926.0  951.0  945.0  948.0   42.854   42.854 1339.200   943.1  134.596    42.854    16.0   !...
 1919   Nov    1   943.1  134.596    12.908     5.0    -40.0  -0.464   926.0  951.0  945.0  948.0   41.472   41.472 1296.000   940.5  108.496    41.472    16.0   !...
 1919   Dec    1   940.5  108.496     7.660     2.9    -11.0  -0.102   926.0  951.0  945.0  948.0   42.854   42.854 1339.200   936.6   71.404    42.854    16.0   !...
 1920   Jan    1   936.6   71.404     8.035     3.0    -30.0  -0.193   926.0  951.0  940.0  948.0   42.854   42.854 1339.200   931.2   38.778    42.854    16.0   !...
 1920   Feb    1   931.2   38.778     7.330     3.0     -9.0  -0.038   926.0  951.0  935.0  948.0   38.707   38.707 1209.600   926.0   16.000    28.146    11.6   !.!.
 1920   Mar    1   926.0   16.000    10.553     3.9    -24.0  -0.080   926.0  951.0  930.0  948.0   42.854   42.854 1339.200   926.0   16.000    10.633     4.0   !.!.
 1920   Nov    1   945.7  173.121    10.498     4.1     -2.0  -0.028   926.0  951.0  945.0  948.0   41.472   41.472 1296.000   943.7  142.175    41.472    16.0   !...
 1920   Dec    1   943.7  142.175     7.205     2.7    -11.0  -0.130   926.0  951.0  945.0  948.0   42.854   42.854 1339.200   940.5  108.858    42.854    16.0   !...
 1921   Jan    1   940.5  108.656     7.446     2.8    -14.0  -0.130   926.0  951.0  940.0  948.0   42.854   42.854 1339.200   936.5   71.378    42.854    16.0   !...
 1921   Feb    1   936.5   71.378     5.758     2.4     -9.0  -0.059   926.0  951.0  935.0  948.0   38.707   38.707 1209.600   931.5   38.487    38.707    16.0   !...
 1921   Mar    1   931.5   38.487     6.535     2.4    -31.0  -0.131   926.0  951.0  930.0  948.0   42.854   42.854 1339.200   926.0   16.000    29.153    10.9   !.!.
 1921   Oct    1   945.7  172.068    20.249     7.6     74.0   1.055   926.0  951.0  945.0  948.0   42.854   42.854 1339.200   944.2  148.407    42.854    16.0   !...
 1921   Nov    1   944.2  148.407    10.783     4.2    -20.0  -0.248   926.0  951.0  945.0  948.0   41.472   41.472 1296.000   941.5  117.985    41.472    16.0   !...
 1921   Dec    1   941.5  117.985     6.134     2.3     -7.0  -0.071   926.0  951.0  945.0  948.0   42.854   42.854 1339.200   937.9   81.315    42.854    16.0   !...
```

APPENDIX D18

SAMPLE OUTPUT

MODULE 8
Perform Historical Simulation

Boundary Shortage Details
(MODULE8.STG)

```
file:  MODULE8.STG

            Historical Simulation:  Apportionment Detail                    Date: TEST RUN 25/03/88     Page:  1

                                    TEST RUN FOR USER MANUAL

   Forecast Year: 1990              with reservoir drawdowns & with consumption cutbacks

                 Shortage  (MCM)            No. of   Upstream Reservoir                 Downstream Node                        Upstream Cutback Node
                 -------------------------  Upstream ------------------------------     -----------------------------------    -------------------------------------------
   Year  Month Node consume  boundry   total Resvoirs  #   min.   old    new   volume  #    old     old     new     new
                                                            r.c.  elevn  elevn released     inflow  outflow inflow  outflow   #  domestic    cutback  factors
                                                             m      m      m     MCM        MCM     MCM     MCM     MCM                 livestock   industrial  irrigation  Comments
```

APPENDIX D19

SAMPLE OUTPUT

MODULE 8
Perform Historical Simulation

Summary Tables
(MODULE8.SUM)

```
file:  MODULE8.SUM

            Historical Simulation:  Summary Tables                                   Date: TEST RUN 25/03/88     Page:  1


     Node:  1         Forecast Year: 1999            TEST RUN FOR USER MANUAL
     I.D.: RSRVR01    Season Months:  May  to  Sep
                                                     with reservoir drawdowns & with consumption cutbacks

                                                                PERCENTAGE  OF  OCCURRENCES
                                                  -------------------------------------------------------------
                                                   0-    20-   40-   60-   80-   100-  120-  140-  160-  over     No      Summary
                                  Month   No.     19 %  39 %  59 %  79 %  99 % 119 % 139 % 159 % 179 % 180 %   Supply  <100 >100
                                  -----  -----    ----- ----- ----- ----- ----- ----- ----- ----- ----- -----   ------  ---- ----

          Demanded Intake          Jan    10      100     0     0     0     0     0     0     0     0     0       0     100    0
        (as a percentage of        Feb    10      100     0     0     0     0     0     0     0     0     0       0     100    0
         available inflow)         Mar    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Apr    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   May    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Jun    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Jul    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Aug    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Sep    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Oct    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Nov    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Dec    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                  Months  120     100     0     0     0     0     0     0     0     0     0       0     100    0
                                  Season   10     100     0     0     0     0     0     0     0     0     0       0     100    0
                                  Annual   10     100     0     0     0     0     0     0     0     0     0       0     100    0

        Demanded  Consumption      Jan    10      100     0     0     0     0     0     0     0     0     0       0     100    0
        (as a percentage of        Feb    10      100     0     0     0     0     0     0     0     0     0       0     100    0
         available inflow)         Mar    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Apr    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   May    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Jun    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Jul    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Aug    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Sep    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Oct    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Nov    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                   Dec    10      100     0     0     0     0     0     0     0     0     0       0     100    0
                                  Months  120     100     0     0     0     0     0     0     0     0     0       0     100    0
                                  Season   10     100     0     0     0     0     0     0     0     0     0       0     100    0
                                  Annual   10     100     0     0     0     0     0     0     0     0     0       0     100    0

        Demanded  Min. Flow       No Minimum Flow Requirements
        (as a percentage of
        available  outflow)
```

```
          Historical Simulation:  Summary Tables                              Date: TEST RUN 25/03/88     Page:  2

Node:  1          Forecast Year: 1999               TEST RUN FOR USER MANUAL
I.D.: RSRVR01     Season Months:  May  to  Sep
                                                    with reservoir drawdowns & with consumption cutbacks


                                                    AMOUNT  (in MCM)
        -------------------------------------------------------------------------------------------------------
        MINIMUM             ACTUAL                            AVERAGE                 MAXIMUM           ACTUAL
        -------  ------------------------  ---------------------------------  -------  -------------------------
        Supply   Intake  Consume  Outflow  Supply   Intake  Consume  Outflow  Supply   Intake  Consume  Outflow
        -------  ------- -------  -------  -------  ------- -------  -------  -------  ------- -------  -------
 Jan       7.4      0.0     0.0     42.9     12.6      0.0     0.0     42.9     22.3      0.0     0.0     42.9
 Feb       5.8      0.0     0.0     38.7     10.3      0.0     0.0     37.7     15.7      0.0     0.0     38.7
 Mar       6.5      0.0     0.0     29.2     19.5      0.0     0.0     38.3     51.5      0.0     0.0     42.9
 Apr      31.9      0.0     0.0     41.5     85.4      0.0     0.0     44.1    147.7      0.0     0.0     68.2
 May      69.3      0.0     0.0     52.4    156.5      0.0     0.0    102.4    334.9      0.0     0.0    208.8
 Jun      64.6      0.0     0.0     41.5    201.1      0.0     0.0    181.6    435.1      0.0     0.0    432.1
 Jul      50.3      0.0     0.0     42.9    204.5      0.0     0.0    198.0    611.6      0.0     0.0    611.1
 Aug      47.8      0.0     0.0     46.0    124.2      0.0     0.0    119.6    296.6      0.0     0.0    294.6
 Sep      24.6      0.0     0.0     41.5     86.4      0.0     0.0     88.9    255.1      0.0     0.0    254.8
 Oct      20.2      0.0     0.0     42.9     58.0      0.0     0.0     64.3    124.6      0.0     0.0    123.7
 Nov      10.5      0.0     0.0     41.5     29.9      0.0     0.0     44.3     64.7      0.0     0.0     64.8
 Dec       6.1      0.0     0.0     42.9     14.1      0.0     0.0     42.9     30.8      0.0     0.0     42.9

Season   303.9      0.0     0.0    211.5    772.5      0.0     0.0    690.4   1646.0      0.0     0.0   1519.5

Annual   434.0      0.0     0.0    504.6   1002.5      0.0     0.0   1004.8   1899.6      0.0     0.0   1877.3


YEAR OF OCCURRENCE OF SUPPLY
----------------------------
         MINIMUM    MAXIMUM
         -------    -------
 Jan      1921       1917
 Feb      1921       1917
 Mar      1921       1918
 Apr      1914       1917
 May      1918       1920
 Jun      1919       1915
 Jul      1919       1915
 Aug      1914       1915
 Sep      1921       1916
 Oct      1921       1916
 Nov      1920       1916
 Dec      1921       1916

Season    1919       1915

Annual    1919       1915

NOTE: in cases where there is more than one year with the same minimum or maximum supply, then
      the choice is based on the year with the larger or smaller intake amounts (respectively).
```

```
             Historical Simulation:  Summary Tables                              Date: TEST RUN 25/03/88     Page:  3

   Node:  1          Forecast Year: 1999            TEST RUN FOR USER MANUAL
   I.D.: RSRVR01
                                                    with reservoir drawdowns & with consumption cutbacks


                            CONSUMPTION CUTBACKS SUMMARY      PERCENTAGE OF OCCURRENCES
                       ---------------------------------------------------------------------
   Month  No.          domestic            livestock            industrial           irrigation
   -----  ---          ----------          ----------           ----------           ----------
    Jan    10             0.0                 0.0                  0.0                  0.0
    Feb    10             0.0                 0.0                  0.0                  0.0
    Mar    10             0.0                 0.0                  0.0                  0.0
    Apr    10             0.0                 0.0                  0.0                  0.0
    May    10             0.0                 0.0                  0.0                  0.0
    Jun    10             0.0                 0.0                  0.0                  0.0
    Jul    10             0.0                 0.0                  0.0                  0.0
    Aug    10             0.0                 0.0                  0.0                  0.0
    Sep    10             0.0                 0.0                  0.0                  0.0
    Oct    10             0.0                 0.0                  0.0                  0.0
    Nov    10             0.0                 0.0                  0.0                  0.0
    Dec    10             0.0                 0.0                  0.0                  0.0

   Season  50             0.0                 0.0                  0.0                  0.0

   Annual 120             0.0                 0.0                  0.0                  0.0


                            CONSUMPTION CUTBACKS SUMMARY     MIN/AVG/MAX CUTBACKS (%)
                       ---------------------------------------------------------------------
   Month  No.          domestic            livestock            industrial           irrigation
   -----  ---          ----------          ----------           ----------           ----------
    Jan    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    Feb    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    Mar    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    Apr    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    May    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    Jun    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    Jul    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    Aug    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    Sep    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    Oct    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    Nov    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
    Dec    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
```

```
         Historical Simulation:  Summary Tables                        Date: TEST RUN 25/03/88     Page:  4

Node:  1         Forecast Year: 1999          TEST RUN FOR USER MANUAL
I.D.: RSRVR01
                                              with reservoir drawdowns & with consumption cutbacks

Name: Reservoir No. 1

                                        RESERVOIR  SUMMARY        PERCENTAGE  OF  OCCURRENCES
                    ----------------------------------------------------------------------------------------------------
                                        Level                                                    Outflow
                    ------------------------------------------------------   -------------------------------------------
                   At Min   Below    At     Within    At    Above   At Max    Below    At    Below    At    Above    At    Above
Month     No.      Supply  Lwr RC  Lwr RC   Bounds  Upr RC  Upr RC  Supply    Min.    Min.   Target  Target  Target  Max.   Max.
-----    -----     ------  ------  ------   ------  ------  ------  ------   ------  ------  ------  ------  ------  ------ ------
 Jan      10          0      20      0        80      0       0       0        0     100       0      0       0       0      0
 Feb      10         10      10      0        80      0       0       0       10      90       0      0       0       0      0
 Mar      10         20       0      0        80      0       0       0       20      80       0      0       0       0      0
 Apr      10          0       0      0        90     10       0       0        0      90       0      0      10       0      0
 May      10          0       0      0        50     50       0       0        0      50       0      0      50       0      0
 Jun      10          0       0      0        30     70       0       0        0      30       0      0      70       0      0
 Jul      10          0      10      0        10     80       0       0        0      20       0      0      80       0      0
 Aug      10          0      10      0        10     80       0       0        0      20       0      0      80       0      0
 Sep      10          0      10      0        30     60       0       0        0      40       0      0      60       0      0
 Oct      10          0      20      0        20     60       0       0        0      40       0      0      60       0      0
 Nov      10          0      30      0        40     30       0       0        0      70       0      0      30       0      0
 Dec      10          0      40      0        60      0       0       0        0     100       0      0       0       0      0

Total    120          2      12      0        48     37       0       0        2      61       0      0      37       0      0


                   Min     E1 -    Lwr RC   E2 -    Upr RC   E3 -             Below    Min     E1 -   Target   E2 -   Above
Month     No.      - E1   Lwr RC   - E2    Upr RC   - E3     Max              Min     - E1   Target   - E2    Max    Max
-----    -----     ------  ------  ------   ------  ------  ------           ------  ------  ------  ------  ------ ------
 Jan      10         10      10     40        40      0       0                0     100       0      0       0      0
 Feb      10         10      10     40        40      0       0               10      90       0      0       0      0
 Mar      10         20       0     40        40      0       0               20      80       0      0       0      0
 Apr      10          0       0     60        30     10       0                0      90       0     10       0      0
 May      10          0       0     30        20     50       0                0      50       0     50       0      0
 Jun      10          0       0     10        20     70       0                0      30       0     70       0      0
 Jul      10          0      10      0        10     80       0                0      20       0     80       0      0
 Aug      10          0      10      0        10     80       0                0      20       0     80       0      0
 Sep      10          0      10     10        20     60       0                0      40       0     60       0      0
 Oct      10          0      20     10        10     60       0                0      40       0     60       0      0
 Nov      10          0      30     10        30     30       0                0      70       0     30       0      0
 Dec      10          0      40     30        30      0       0                0     100       0      0       0      0

Total    120          3      12     23        25     37       0                2      61       0     37       0      0

NOTE: "En" represents an evaluation value.
```

```
          Historical Simulation:  Summary Tables                        Date: TEST RUN 25/03/88     Page:  5

Node:  2          Forecast Year: 1999          TEST RUN FOR USER MANUAL
I.D.: NODE_02     Season Months:  May  to  Sep
                                               with reservoir drawdowns & with consumption cutbacks

                                                           PERCENTAGE  OF  OCCURRENCES
                                            ----------------------------------------------------------------
                                            0-    20-    40-    60-    80-   100-   120-   140-   160-   over      No      Summary
                            Month   No.    19 %   39 %   59 %   79 %   99 %  119 %  139 %  159 %  179 %  180 %   Supply   <100 >100
                            -----  -----  -----  -----  -----  -----  -----  -----  -----  -----  -----  -----   ------   ---- ----

     Demanded Intake         Jan    10     100     0      0      0      0      0      0      0      0      0        0     100    0
   (as a percentage of       Feb    10     100     0      0      0      0      0      0      0      0      0        0     100    0
    available inflow)        Mar    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Apr    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             May    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Jun    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Jul    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Aug    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Sep    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Oct    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Nov    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Dec    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                            Months 120     100     0      0      0      0      0      0      0      0      0        0     100    0
                            Season  10     100     0      0      0      0      0      0      0      0      0        0     100    0
                            Annual  10     100     0      0      0      0      0      0      0      0      0        0     100    0

   Demanded  Consumption     Jan    10     100     0      0      0      0      0      0      0      0      0        0     100    0
   (as a percentage of       Feb    10     100     0      0      0      0      0      0      0      0      0        0     100    0
    available inflow)        Mar    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Apr    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             May    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Jun    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Jul    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Aug    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Sep    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Oct    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Nov    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                             Dec    10     100     0      0      0      0      0      0      0      0      0        0     100    0
                            Months 120     100     0      0      0      0      0      0      0      0      0        0     100    0
                            Season  10     100     0      0      0      0      0      0      0      0      0        0     100    0
                            Annual  10     100     0      0      0      0      0      0      0      0      0        0     100    0

    Demanded  Min. Flow     No Minimum Flow Requirements
   (as a percentage of
   available  outflow)
```

```
          Historical Simulation:  Summary Tables                          Date: TEST RUN 25/03/88     Page:  6

      Node:  2        Forecast Year: 1999          TEST RUN FOR USER MANUAL
      I.D.: NODE_02   Season Months:  May  to  Sep
                                                   with reservoir drawdowns & with consumption cutbacks


                                                    AMOUNT  (in MCM)
              -------------------------------------------------------------------------------------------------------
              MINIMUM             ACTUAL                          AVERAGE                MAXIMUM           ACTUAL
              -------  -------------------------  ---------------------------------  -------  -------------------------
              Supply   Intake   Consume  Outflow  Supply   Intake   Consume  Outflow  Supply   Intake   Consume  Outflow
              -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------  -------
       Jan      51.5      1.3      0.6     51.0     57.1      1.3      0.6     56.6     67.5      1.3      0.6     66.9
       Feb      36.7      1.2      0.5     36.2     49.5      1.2      0.5     48.9     56.3      1.2      0.5     55.8
       Mar      22.7      1.3      0.6     22.1     60.0      1.3      0.6     59.4     98.9      1.3      0.6     98.4
       Apr      76.5      1.7      0.6     75.9    136.9      1.7      0.6    136.2    227.9      1.7      0.6    227.2
       May     118.7      2.4      1.0    117.7    271.6      2.3      0.9    270.8    687.9      2.2      0.9    687.1
       Jun     111.8      2.7      1.2    110.6    398.8      2.5      1.1    397.7    901.2      2.3      0.9    900.2
       Jul      97.8      3.0      1.3     96.5    418.9      2.8      1.2    417.7   1270.4      2.5      1.1   1269.3
       Aug      95.2      2.5      1.1     94.2    254.1      2.6      1.1    253.0    614.5      2.5      1.1    613.5
       Sep      68.9      2.4      1.0     67.9    182.8      2.5      1.1    181.7    530.2      2.5      1.0    529.2
       Oct      65.5      1.7      0.7     64.8    127.5      1.7      0.7    126.8    258.5      1.7      0.7    257.8
       Nov      53.4      1.3      0.5     52.8     77.2      1.3      0.5     76.7    135.2      1.3      0.5    134.6
       Dec      50.2      1.3      0.6     49.7     58.7      1.3      0.6     58.2     76.8      1.3      0.6     76.1

      Season   542.7     12.9      5.5    537.3   1526.1     12.7      5.3   1520.8   3295.2     12.0      4.9   3290.4

      Annual   981.0     22.9      9.5    971.5   2093.0     22.6      9.4   2083.6   3931.0     21.9      8.9   3922.1


      YEAR OF OCCURRENCE OF SUPPLY
      ----------------------------
              MINIMUM    MAXIMUM
              -------    -------
       Jan      1921       1917
       Feb      1920       1917
       Mar      1920       1918
       Apr      1914       1917
       May      1914       1917
       Jun      1919       1915
       Jul      1919       1915
       Aug      1921       1915
       Sep      1921       1916
       Oct      1921       1916
       Nov      1920       1916
       Dec      1921       1916

      Season    1919       1915

      Annual    1919       1915


      NOTE: in cases where there is more than one year with the same minimum or maximum supply, then
            the choice is based on the year with the larger or smaller intake amounts (respectively).
```

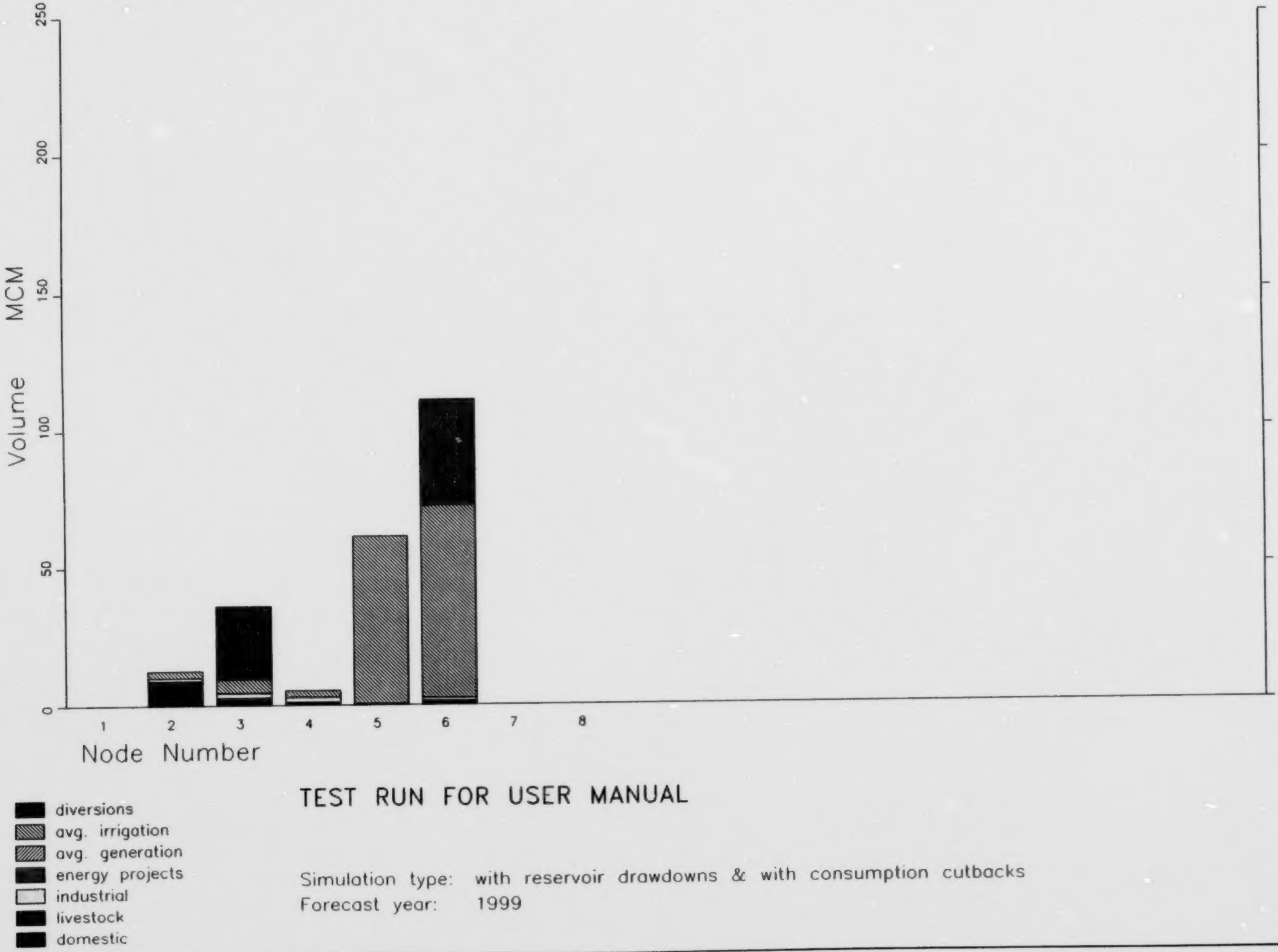
```
        Historical Simulation:  Summary Tables                          Date: TEST RUN 25/03/88     Page:  7

Node:  2          Forecast Year: 1999             TEST RUN FOR USER MANUAL
I.D.: NODE_02
                                                  with reservoir drawdowns & with consumption cutbacks


                         CONSUMPTION CUTBACKS SUMMARY       PERCENTAGE OF OCCURRENCES
                   ---------------------------------------------------------------------------
Month  No.         domestic           livestock           industrial          irrigation
-----  ---         ----------         ----------          ----------          ----------
 Jan    10            0.0                0.0                 0.0                 0.0
 Feb    10            0.0                0.0                 0.0                 0.0
 Mar    10            0.0                0.0                 0.0                 0.0
 Apr    10            0.0                0.0                 0.0                 0.0
 May    10            0.0                0.0                 0.0                 0.0
 Jun    10            0.0                0.0                 0.0                 0.0
 Jul    10            0.0                0.0                 0.0                 0.0
 Aug    10            0.0                0.0                 0.0                 0.0
 Sep    10            0.0                0.0                 0.0                 0.0
 Oct    10            0.0                0.0                 0.0                 0.0
 Nov    10            0.0                0.0                 0.0                 0.0
 Dec    10            0.0                0.0                 0.0                 0.0

Season  50            0.0                0.0                 0.0                 0.0

Annual 120            0.0                0.0                 0.0                 0.0


                         CONSUMPTION CUTBACKS SUMMARY      MIN/AVG/MAX CUTBACKS (%)
                   ---------------------------------------------------------------------------
Month  No.         domestic           livestock           industrial          irrigation
-----  ---         ----------         ----------          ----------          ----------
 Jan    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 Feb    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 Mar    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 Apr    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 May    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 Jun    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 Jul    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 Aug    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 Sep    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 Oct    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 Nov    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
 Dec    10     0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0   0.0 /  0.0 /  0.0
```

APPENDIX D20

SAMPLE OUTPUT

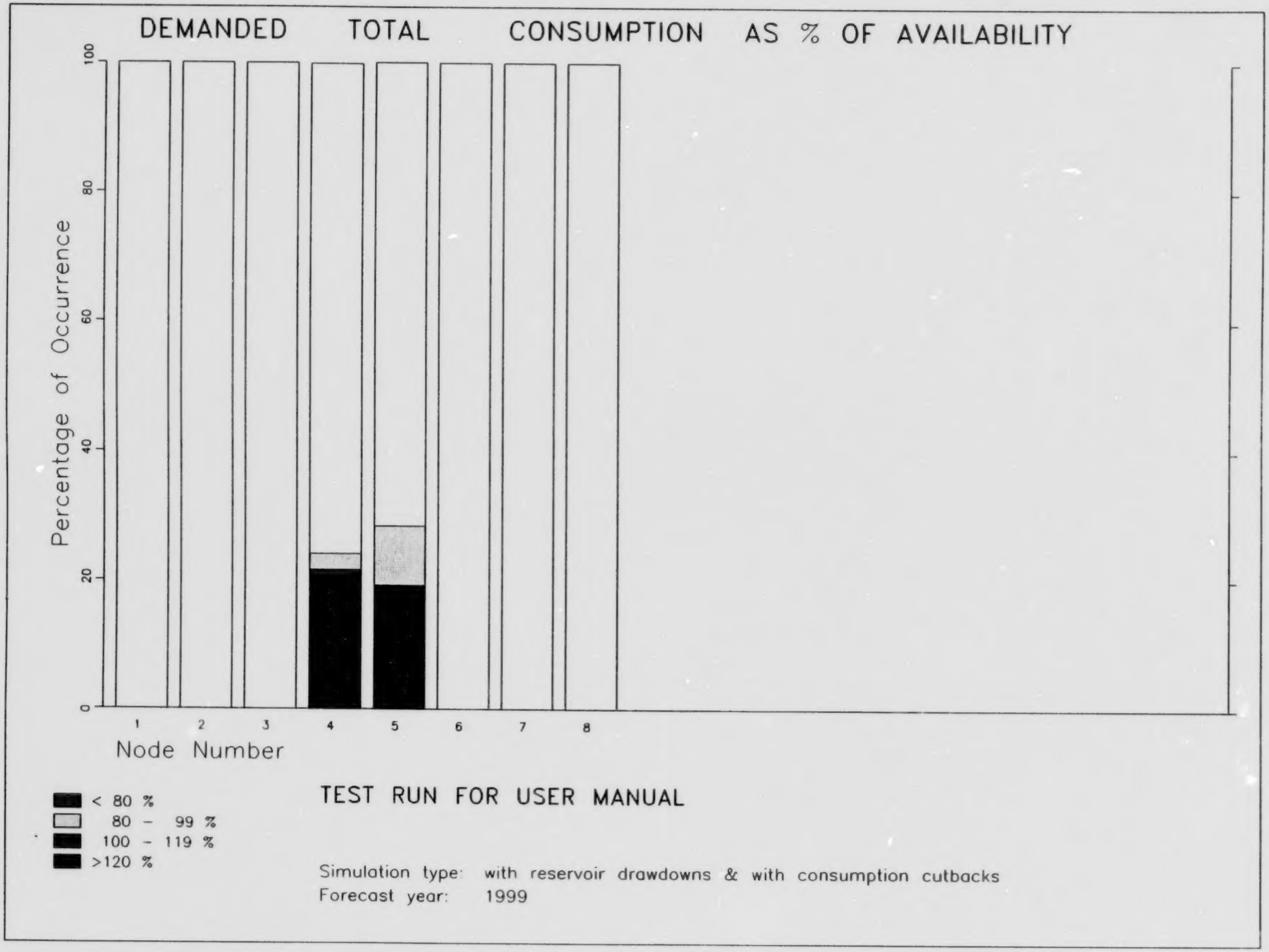
MODULE 9
Create Plots

DEMANDED SEASONAL INTAKE BY USAGE GROUP



TEST RUN FOR USER MANUAL

Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999

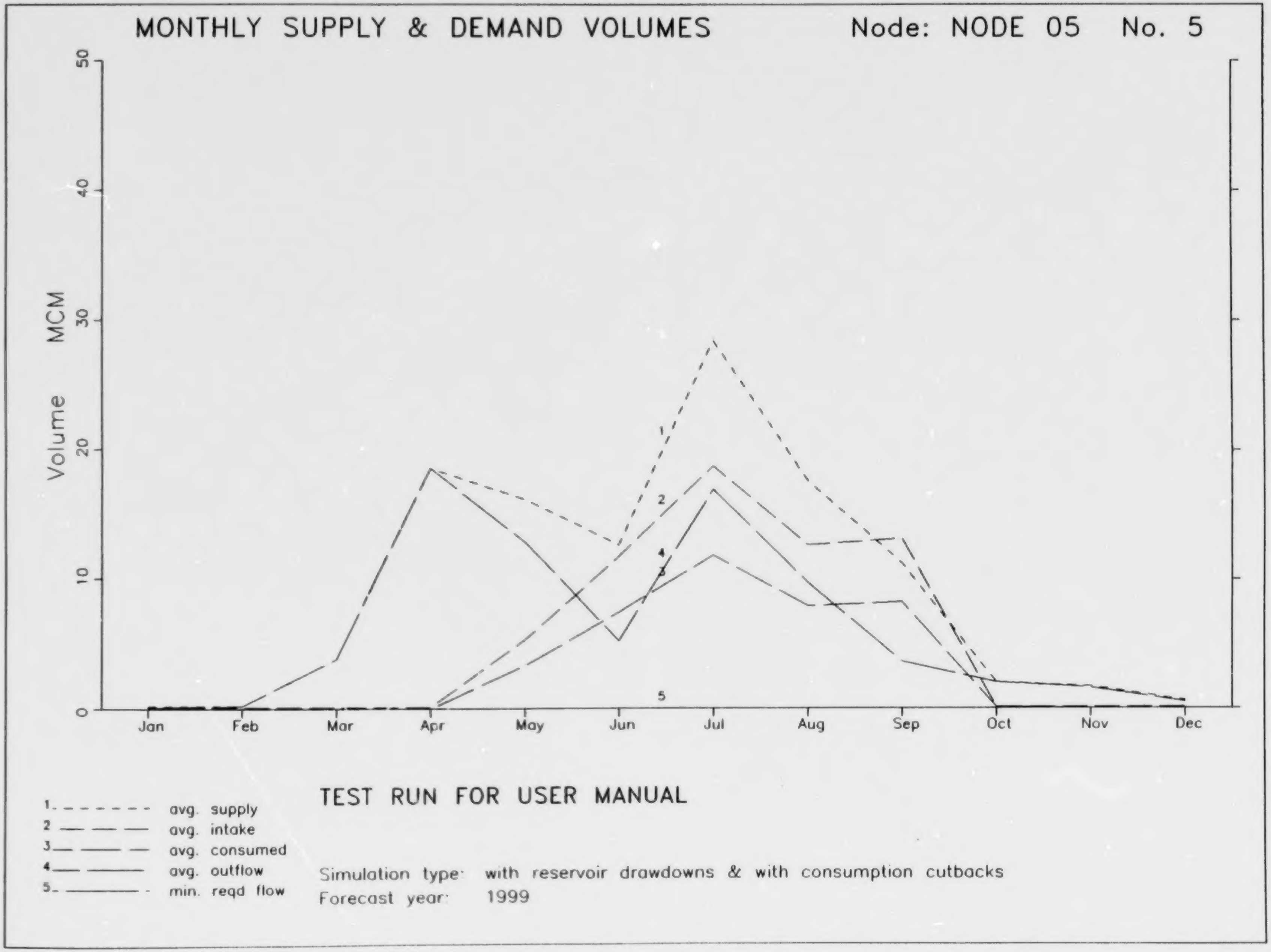


DEMANDED TOTAL CONSUMPTION AS % OF AVAILABILITY

TEST RUN FOR USER MANUAL

Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999

MONTHLY SUPPLY & DEMAND VOLUMES Node: NODE 05 No. 5

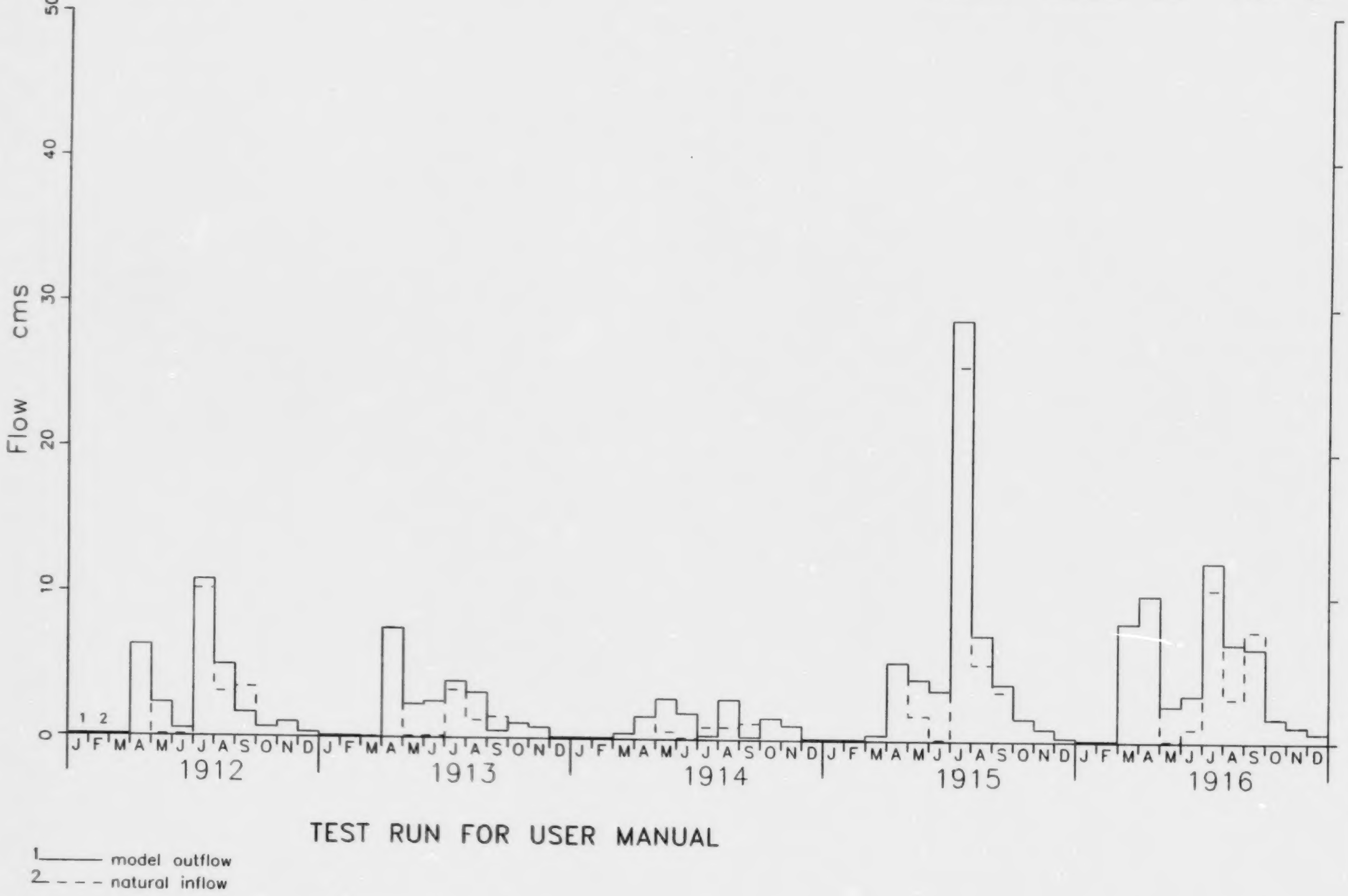


TEST RUN FOR USER MANUAL

Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999

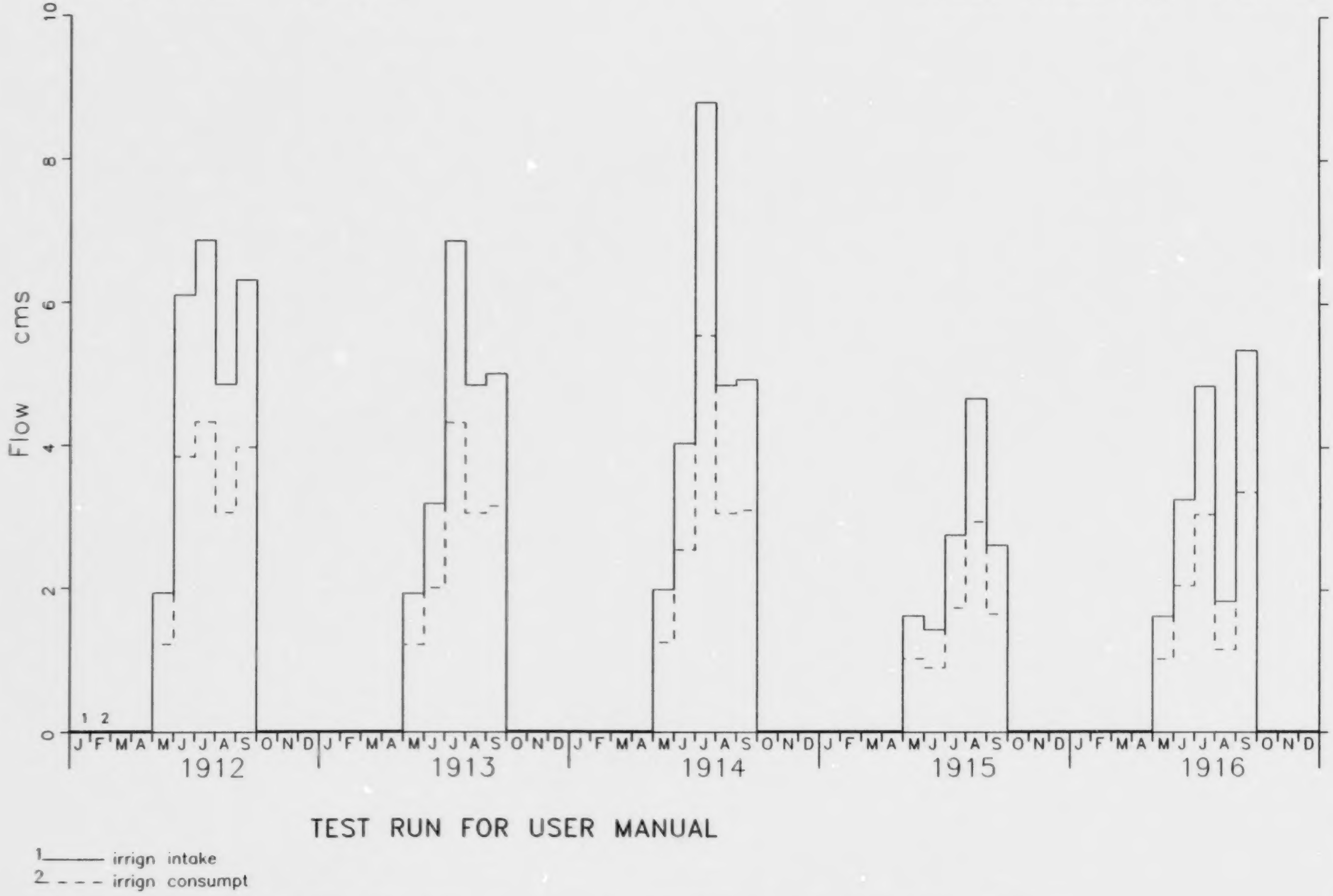
MONTHLY FLOWS

Node: NODE 05 No. 5



TEST RUN FOR USER MANUAL

Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999

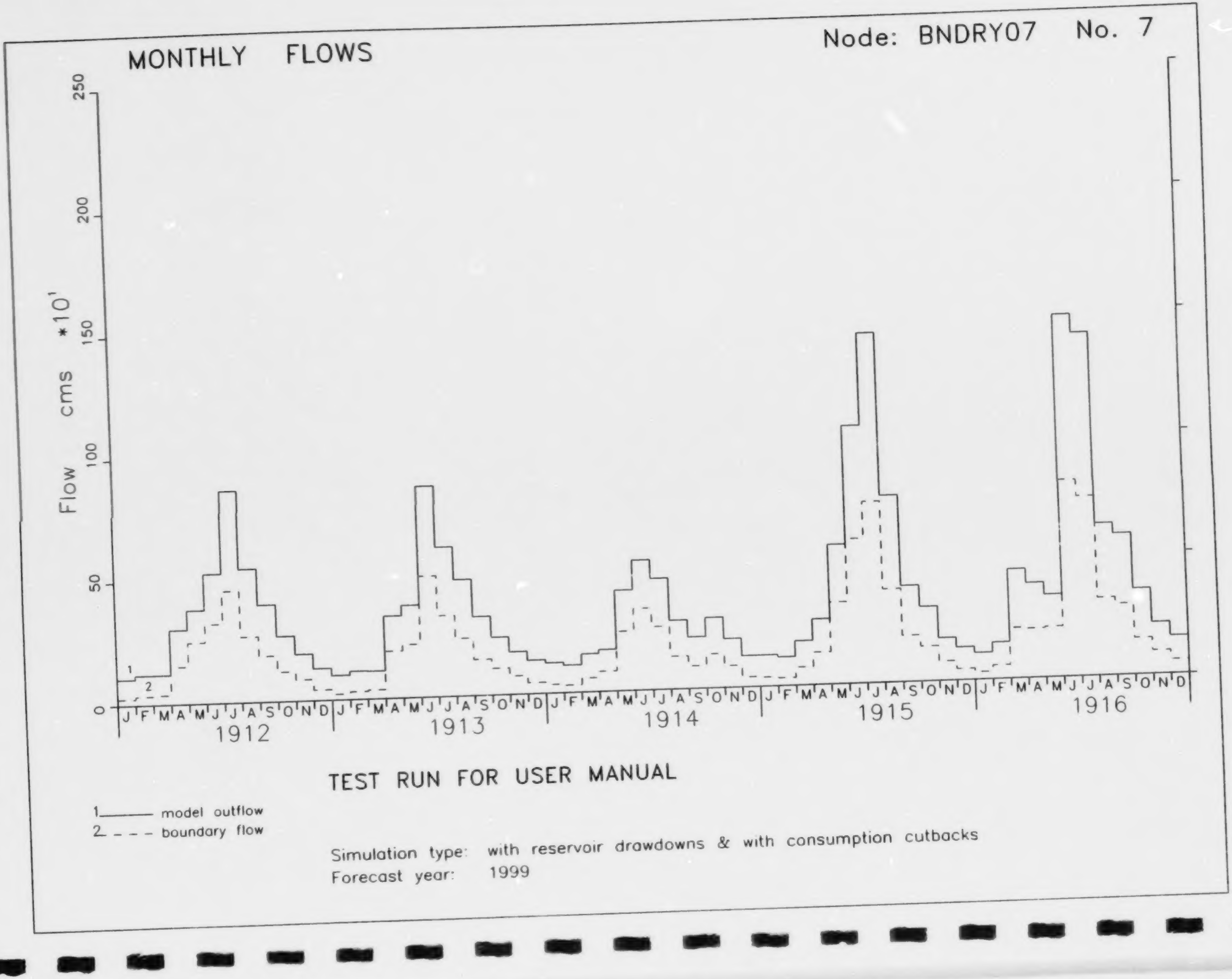


MONTHLY FLOWS

Node: NODE 05 No. 5

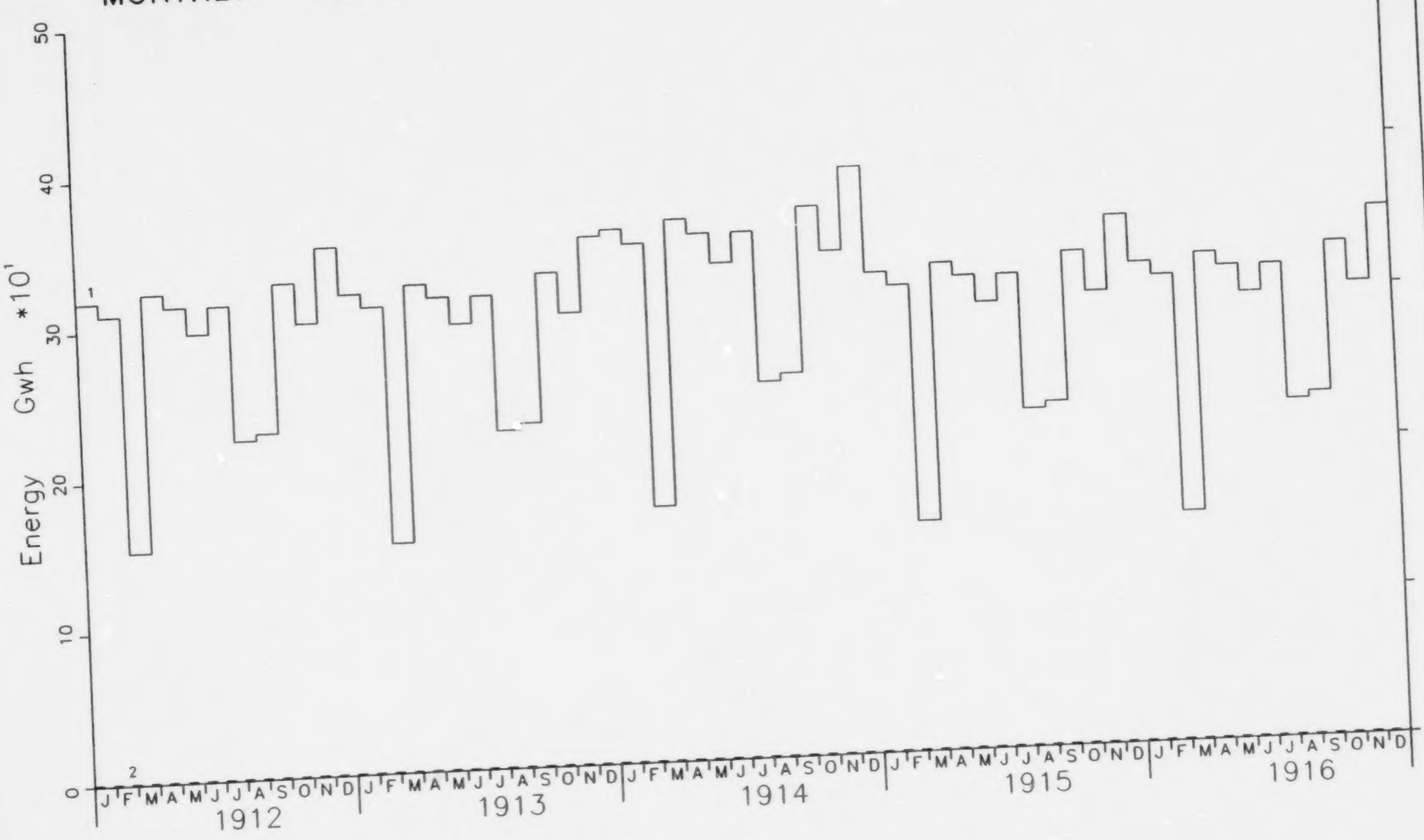
TEST RUN FOR USER MANUAL

Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999


MONTHLY FLOWS
Node: BNDRY07 No. 7
Flow cms *10¹
0
50
100
150
200
250
1
2
J F M A M J J A S O N D
1912
1913
1914
1915
1916
TEST RUN FOR USER MANUAL
1 model outflow
2 boundary flow
Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999

MONTHLY ENERGY

Node: NODE 03 No. 3



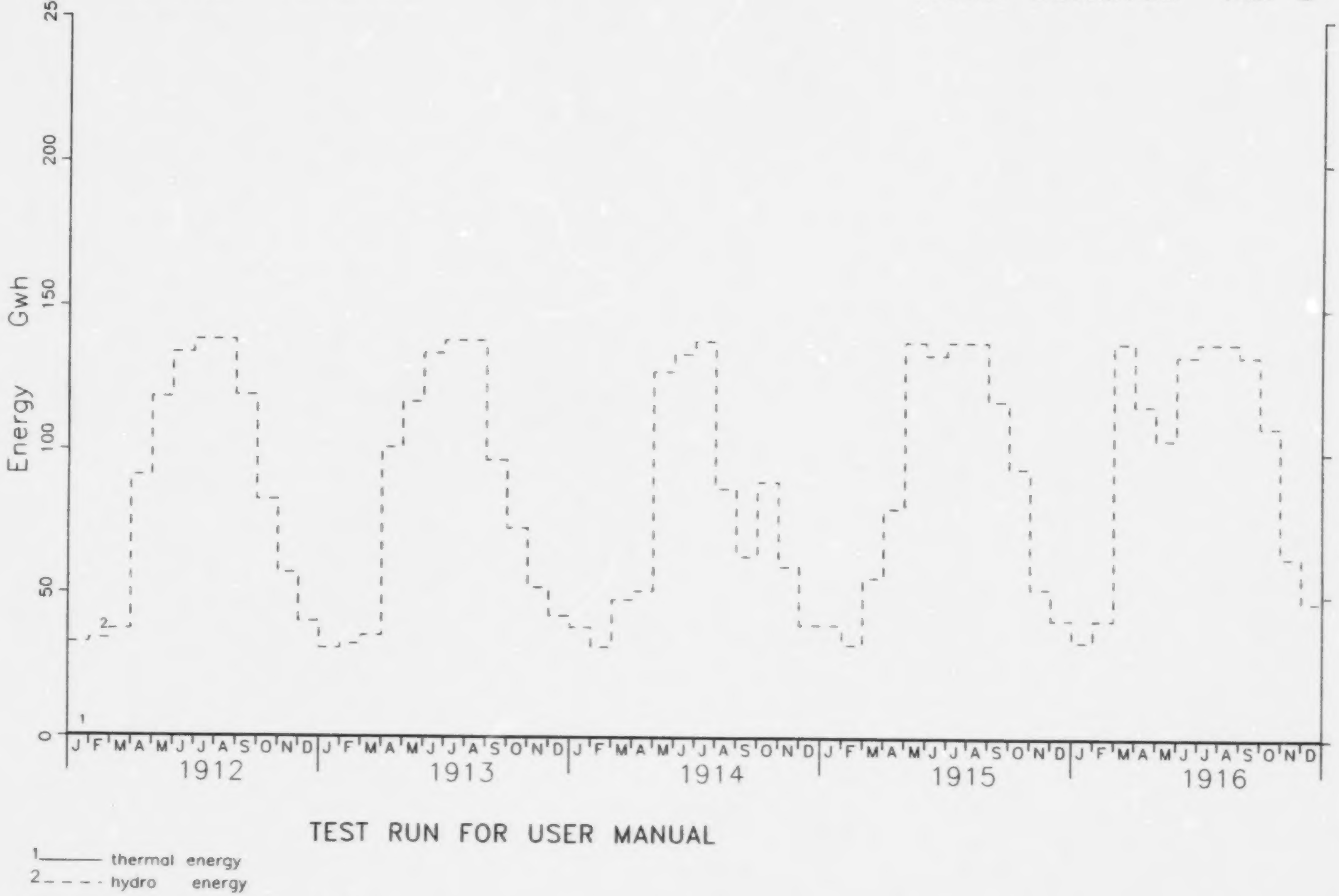
TEST RUN FOR USER MANUAL

1——— thermal energy
2- - - - hydro energy

Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999

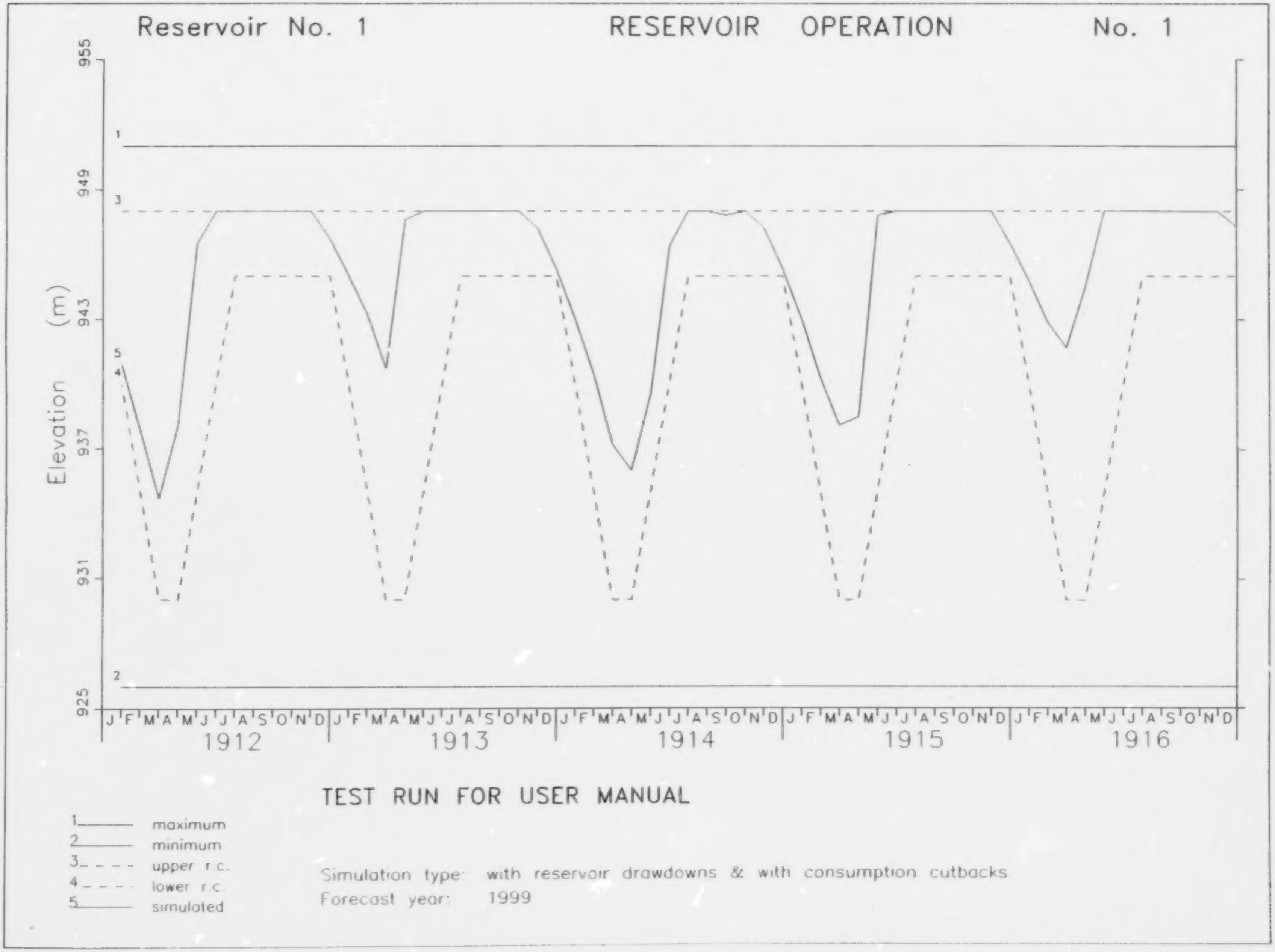
MONTHLY ENERGY

Node: DUMMY08 No. 8



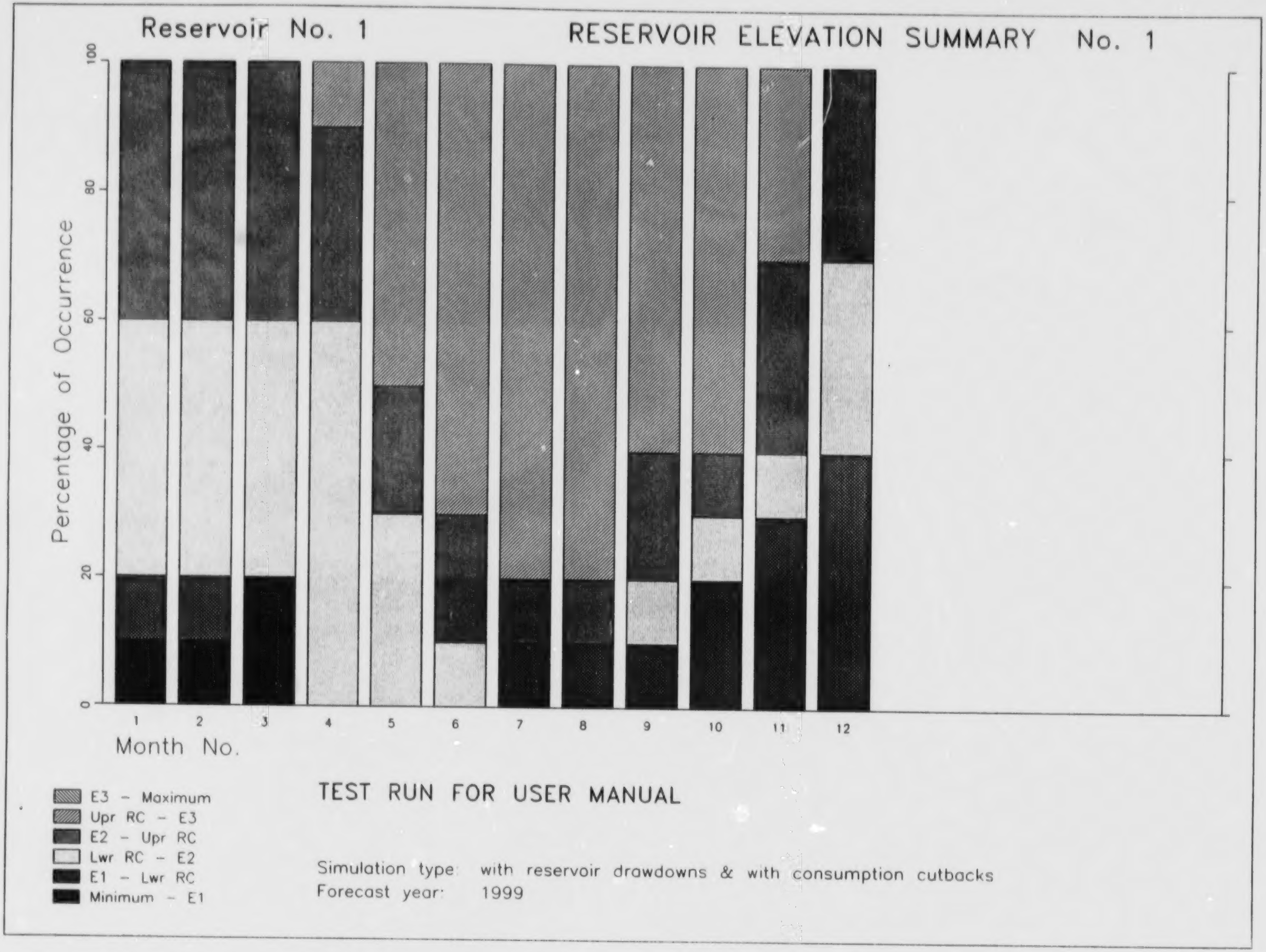
TEST RUN FOR USER MANUAL

Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999



TEST RUN FOR USER MANUAL

Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999



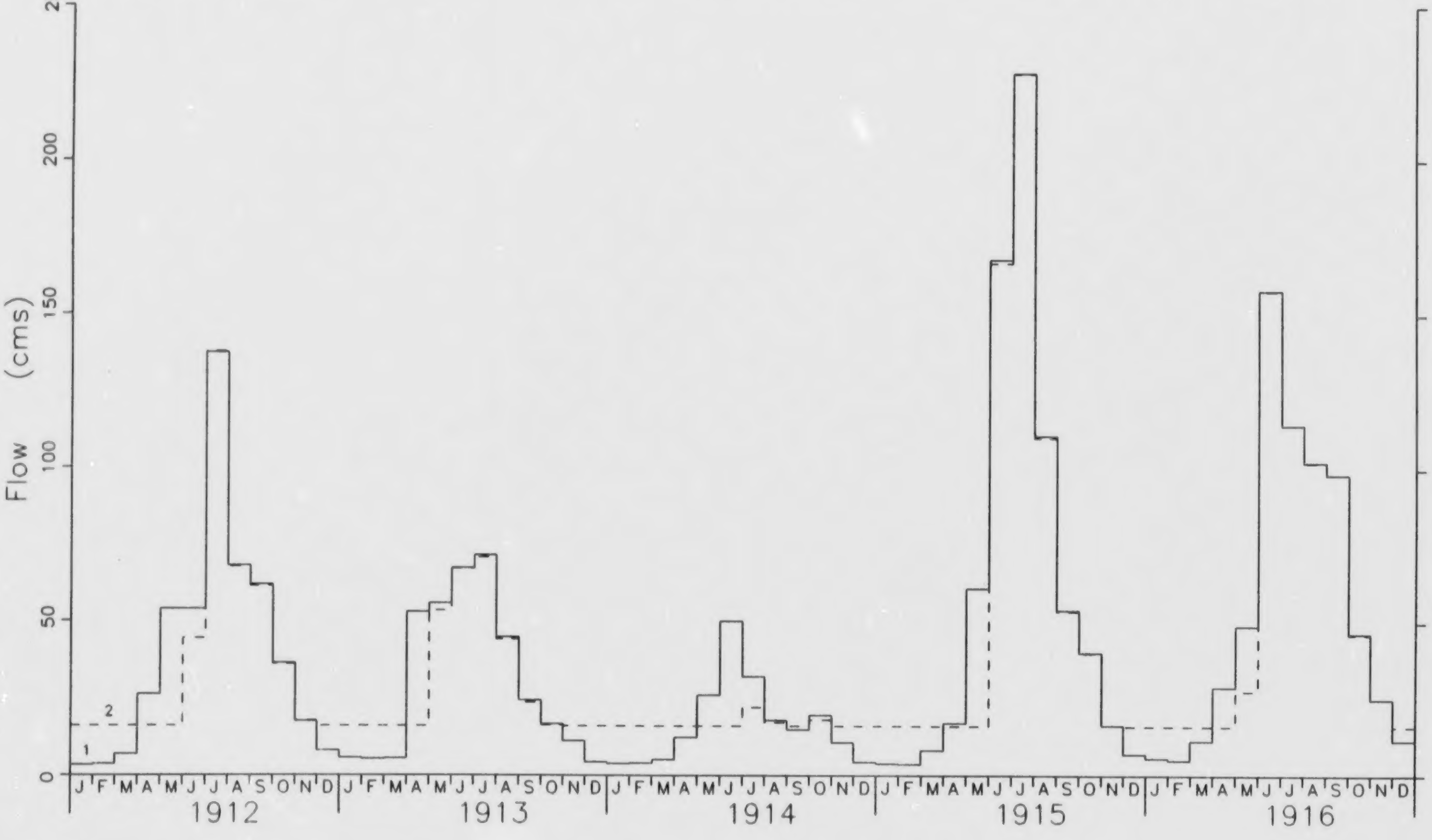
Reservoir No. 1

RESERVOIR ELEVATION SUMMARY No. 1

TEST RUN FOR USER MANUAL

Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999

Reservoir No. 1 RESERVOIR OPERATION No. 1

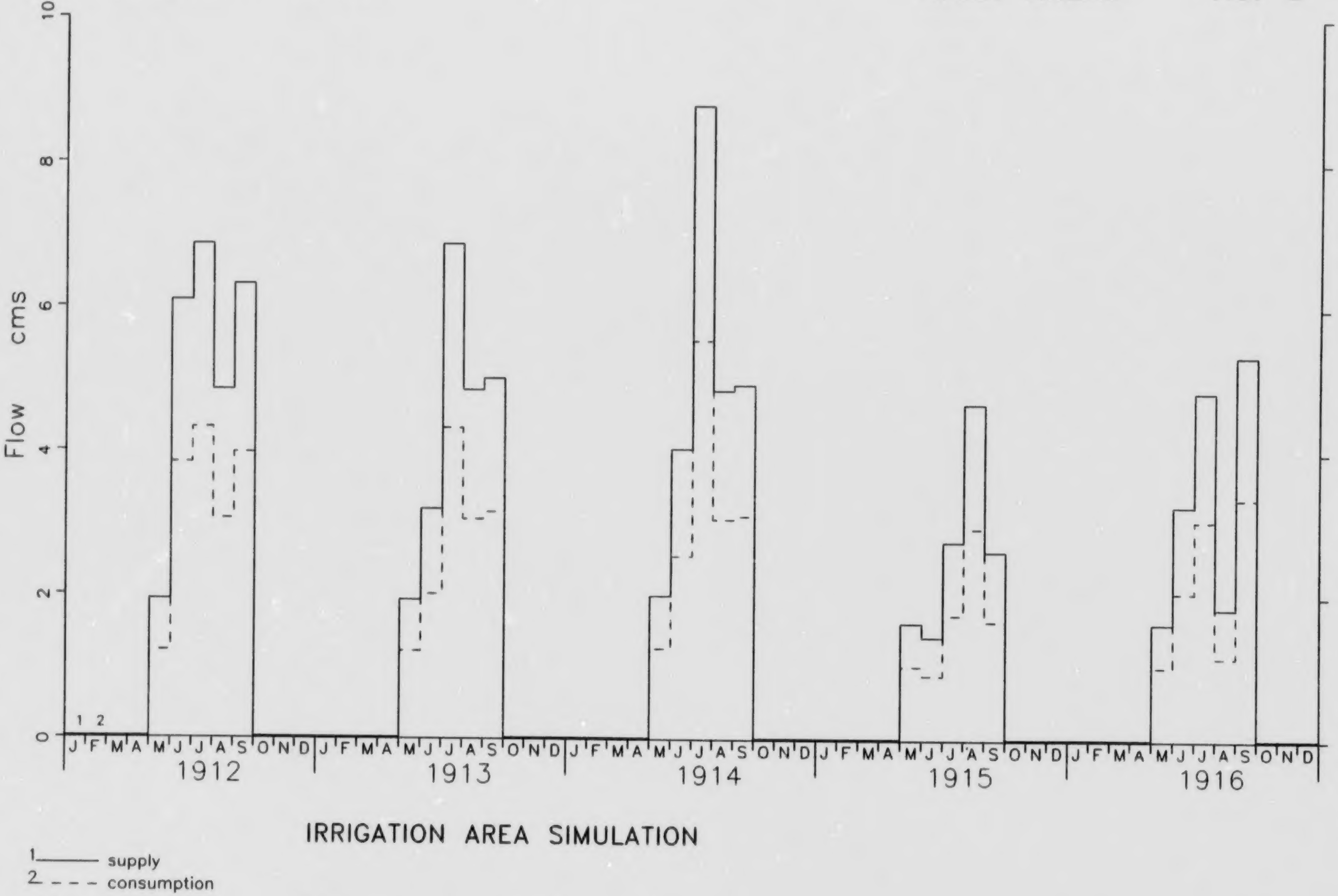


TEST RUN FOR USER MANUAL

Simulation type: with reservoir drawdowns & with consumption cutbacks
Forecast year: 1999

MONTHLY FLOWS

Area: AREA3 No. 3



IRRIGATION AREA SIMULATION

Simulation type: irrigation analysis only
Forecast year: 1999

APPENDIX D21

SAMPLE OUTPUT

MODULE 10
Calculate Hydro Generation

```
file:  MODULE10.DAT

                 MODULE 10:  Hydro Generation Simulation                         Date: TEST RUN 25/03/88     Page:  1

                                             TEST RUN FOR USER MANUAL
Forecast Year:      1999
Number of years:      10                     with reservoir drawdowns & with consumption cutbacks

                                                                                            Monthly  Power  (MW)  &  Monthly  Energy  (GWh)
            Station -----------------------------------------------------------------------------------------------------------------------------------------------------
Year  Node  Number         Jan              Feb              Mar              Apr              May              Jun              Jul              Aug              Sep
----  ----  ------   --------------   --------------   --------------   --------------   --------------   --------------   --------------   --------------   --------------   --
                      Power  Energy    Power  Energy    Power  Energy    Power  Energy    Power  Energy    Power  Energy    Power  Energy    Power  Energy    Power  Energy
1912
         8       1     43.8    32.6     50.4    33.9     50.2    37.4    128.2    90.9    159.2   118.4    186.0   133.9    186.0   138.4    186.0   138.4    165.3   119.0
1913
         8       1     41.6    31.0     48.4    32.5     47.7    35.5    140.2   101.0    157.3   117.0    186.0   133.9    186.0   138.4    186.0   138.4    134.3    96.7
1914
         8       1     51.7    38.4     47.0    31.6     64.8    48.2     70.9    51.1    171.6   127.7    186.0   133.9    186.0   138.4    117.1    87.1     88.1    63.4
1915
         8       1     52.9    39.4     48.6    32.6     75.1    55.9    111.3    80.1    186.0   138.4    186.0   133.9    186.0   138.4    186.0   138.4    163.6   117.8
1916
         8       1     45.2    33.6     61.7    41.5    186.0   138.4    161.6   116.4    140.7   104.7    186.0   133.9    186.0   138.4    186.0   138.4    186.0   133.9
1917
         8       1     52.2    38.9     52.4    35.2     53.0    39.4    147.2   106.0    186.0   138.4    186.0   133.9    186.0   138.4    141.1   105.0    104.2    75.0
1918
         8       1     49.7    37.0     52.2    35.1     86.8    64.6    105.1    75.6    127.0    94.5    186.0   133.9    149.0   110.9    133.1    99.0     89.2    64.2
1919
         8       1     45.3    33.7     47.1    31.7     44.5    33.1     87.8    63.2    143.1   106.5    177.3   127.7    106.7    79.4    144.4   107.4     85.2    61.4
1920
         8       1     43.4    32.3     44.4    29.8     58.4    43.5    159.7   115.0    186.0   138.4    186.0   133.9    186.0   138.4    148.4   110.4     75.3    54.2
1921
         8       1     43.7    32.5     45.1    30.3     52.4    39.0    106.2    76.5    175.6   130.7    186.0   133.9    161.4   120.1    106.5    79.3     59.5    42.8
```

```
           MODULE 10:  Hydro Generation Summary                              Date: TEST RUN 25/03/88     Page:  2

Forecast Year:     1999                        TEST RUN FOR USER MANUAL
Number of years:     10
                                               with reservoir drawdowns & with consumption cutbacks

                  Station ------------------------------------------------------------------ Monthly  Power  (MW)   &   Monthly  Energy  (GWh)
Year   Node   Number     Jan              Feb              Mar              Apr              May              Jun              Jul              Aug              Sep
----   ----   ------  ---------------  ---------------  ---------------  ---------------  ---------------  ---------------  ---------------  ---------------  ---------------  --
                      Power  Energy    Power  Energy    Power  Energy    Power  Energy    Power  Energy    Power  Energy    Power  Energy    Power  Energy    Power  Energy
Avg.
        8        1     47.0    34.9     49.7    33.4     71.9    53.5    121.6    87.6    163.2   121.5    185.1   133.3    171.9   127.9    153.5   114.2    115.1    82.8
```

APPENDIX E

SCREEN ECHO

APPENDIX E1

SCREEN ECHO

Main Routine

```
WATER USE ANALYSIS MODEL   v7.0
Acres International Ltd.
------------------------
               MODULE1  - list general database data file
               MODULE2  - list general forecast data file
               MODULE3  - list gauge detail data files
               MODULE3b - list irrigation area data files
               MODULE3c - list power generation data files
               MODULE4  - list basin configuration data file
               MODULE5  - create basin configuration data file
               MODULE6  - create basin hydrology data file
               MODULE6b - convert hydrology files (cfs to cms)
               MODULE6c - generate simulated streamflow files
               MODULE7  - generate gauge forecast run files
               MODULE7b - generate irrigation forecast run files
               MODULE7c - generate thermal generation forecast run file
               MODULE8  - perform historical simulation
               MODULE9  - display results graphically
               MODULE10 - calculate hydro power generation

               To run any program, simply enter its module name.

C:\WUAM>
```

APPENDIX E2

SCREEN ECHO

Module 1

```
WATER USE ANALYSIS MODEL    v7.0
Acres International Ltd.
------------------------

               max 17 characters
               -----------------
 Enter date  ? TEST RUN 25/03/88
```

```
WATER USE ANALYSIS MODEL    v7.0     Read Data Base File
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\GENERAL\DATABASE.DAT

 Reading DATABASE.DAT file  ...

 Base Year              1981
 No. Months               12
 1st Irrigation Month      5
 2nd Irrigation Month      9
 No. Regions              10
 No. Usage Categories      4
 No. Cutback Increments   10
 No. Provinces             4
 Groundwater Indicator   yes
 No. Urban Uses            1
 No. Rural Uses            1
 No. Livestock Types       6
 No. Crop Types            3
 No. Soil Types            4
 No. Irrigation Types      6
 No. Industrial Sectors   30
 No. Energy Projects      12
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 1:  List Data Base
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE1.OUT
 Writing file  ...


 Output is stored in file:  C:\WUAM\DATA\PRINTOUT\MODULE1.OUT




 End of Program.

C:\WUAM>
```

APPENDIX E3

SCREEN ECHO

Module 2

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 2:  List Forecast File
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\GENERAL\FORECAST.DAT
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE2.OUT

 Number of Years: 25   (1982-2006)

 No. of Population Scenarios:  5

 No. of Livestock  Scenarios:  3

 No. of Industrial Scenarios:  1

 Output is stored in file:  C:\WUAM\DATA\PRINTOUT\MODULE2.OUT


 End of Program.

C:\WUAM>
C:\WUAM>
```

APPENDIX E4

SCREEN ECHO

Module 3

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 3:  List Gauge Details
Acres International Ltd.
-------------------------
 Nodes:        1 - RSRVR01       2 - NODE_02       3 - NODE_03       4 - NODE_04
               5 - NODE_05       6 - NODE_06       7 - BNDRY07       8 - DUMMY08

 Choice ( 1- 8, 999 for ALL, 0 to EXIT)  ? 999




 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE3.OUT
 Opening file  C:\WUAM\DATA\GAUGE\GRSRVR01.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_02.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_03.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_04.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_05.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_06.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GBNDRY07.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GDUMMY08.DAT

 Output is stored in file  MODULE3.OUT


 End of Program.

C:\WUAM>
```

APPENDIX E5

SCREEN ECHO

Module 3B

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 3b:  List Irrigation Details
Acres International Ltd.
------------------------
 Areas:      1 - AREA1         2 - AREA2         3 - AREA3         4 - AREA4
             5 - AREA5         6 - AREA6         7 - AREA7

 Choice (1- 7, or 0 to EXIT)  ? 1

 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE3B.OUT
 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA1.DAT
     Area I.D.:       AREA1
     Area Name:       IRRIGATION AREA 1

     No. Scenarios:  1
     Description:        1987 TEST CASE SCENARIO

2JWATER USE ANALYSIS MODEL   v7.0     MODULE 3b:  List Irrigation Details
Acres International Ltd.
------------------------
 Areas:      1 - AREA1         2 - AREA2         3 - AREA3         4 - AREA4
             5 - AREA5         6 - AREA6         7 - AREA7

 Choice (1- 7, or 0 to EXIT)  ? 0

 Output is stored in file  MODULE3B.OUT


 End of Program.

C:\WUAM>
```

APPENDIX E6

SCREEN ECHO

Module 3C

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 3C:  Electric Power Data
Acres International Ltd.
-------------------------
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE3C.OUT
 Opening file  C:\WUAM\DATA\ELECTRIC\TPOWERDB.DAT
 Opening file  C:\WUAM\DATA\ELECTRIC\HYDROLGY.DAT
 Opening file  C:\WUAM\DATA\ELECTRIC\THERMAL.DAT
 Opening file  C:\WUAM\DATA\ELECTRIC\HYDRO.DAT


 End of Program.


C:\WUAM>
```

APPENDIX E7

SCREEN ECHO

Module 4

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 4:  List BASIN.DAT File
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\BASIN\BASIN.DAT
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE4.OUT


 Output is stored in file:  C:\WUAM\DATA\PRINTOUT\MODULE4.OUT




 End of Program.

C:\WUAM>
```

APPENDIX E8

SCREEN ECHO

Module 5

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------

 Options: 0 - EXIT
          1 - READ   old file BASIN.OLD and continue input
          2 - CREATE new file BASIN.DAT

 Choice ? 2
 Opening file  C:\WUAM\DATA\BASIN\BASIN.DAT

 Enter the number of nodes in the basin   (1 - 50)  ? 8

 Enter the first node number in the basin (1 - 92)  ? 1
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Node:  1
 --------

 Enter node identifier (7 characters)  ? RSRVR01

 Since this is the first node, it cannot have any upstream nodes.

 Enter downstream node number ( 2- 8, or 0)  ? 2
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Node:  2
 --------

 Enter node identifier (7 characters)  ? NODE_02

  1 upstream nodes found.

 Enter downstream node number ( 3- 8, or 0)  ? 3
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULES5:  Create BASIN.DAT File
Acres International Ltd.
-------------------------
 Node:  3
 --------

 Enter node identifier (7 characters)  ? NODE_03

  1 upstream nodes found.

 Enter downstream node number ( 4- 8, or 0)  ? 6
```

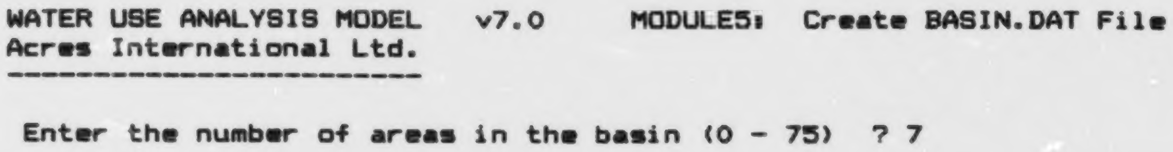
```
WATER USE ANALYSIS MODEL   v7.0     MODULES5:  Create BASIN.DAT File
Acres International Ltd.
-------------------------
 Node:  4
 --------

 Enter node identifier (7 characters)  ? NODE_04

  0 upstream nodes found.

 Enter downstream node number ( 5- 8, or 0)  ? 6
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Node:  5
 --------

 Enter node identifier (7 characters)  ? NODE_05

  0 upstream nodes found.

 Enter downstream node number ( 6- 8, or 0)  ? 6
```

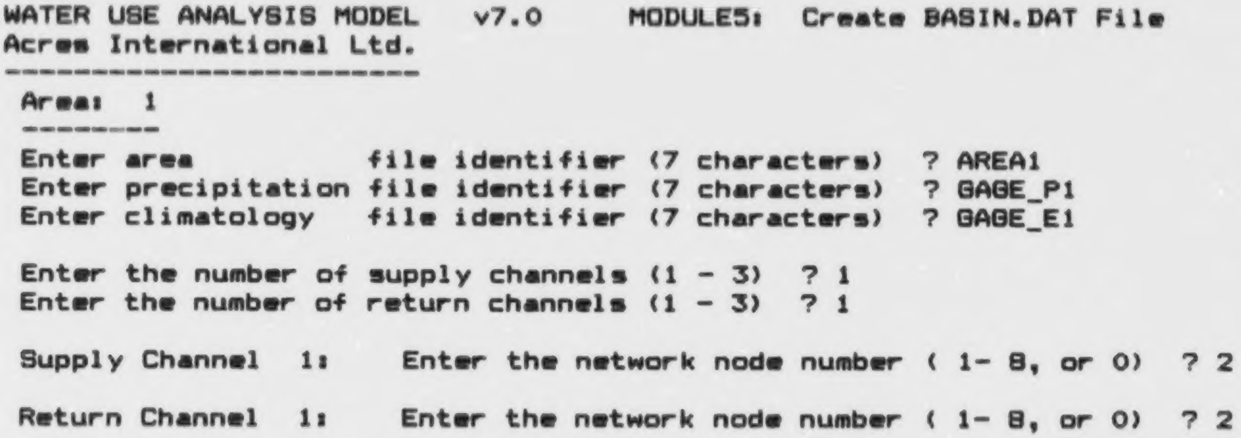
```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Node:  6
 --------

 Enter node identifier (7 characters)  ? NODE_06

  3 upstream nodes found.

 Enter downstream node number ( 7- 8, or 0)  ? 7
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Node:  7
 --------

 Enter node identifier (7 characters)  ? BNDRY07

  1 upstream nodes found.

 Enter downstream node number ( 8- 8, or 0)  ? 8
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Node:  8
 --------

 Enter node identifier (7 characters)  ? DUMMY08


  1 upstream nodes found.

 Since this is the last node, it cannot have any downstream nodes.
2JWATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------

 Enter the number of areas in the basin (0 - 75)  ?
```



```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------

 Enter the number of areas in the basin (0 - 75)  ? 7
```



```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Area:  1
 --------
 Enter area          file identifier (7 characters)  ? AREA1
 Enter precipitation file identifier (7 characters)  ? GAGE_P1
 Enter climatology   file identifier (7 characters)  ? GAGE_E1

 Enter the number of supply channels (1 - 3)  ? 1
 Enter the number of return channels (1 - 3)  ? 1

 Supply Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 2

 Return Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 2
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Area:  2
 --------
 Enter area            file identifier (7 characters)  ? AREA2
 Enter precipitation file identifier (7 characters)  ? GAGE_P1
 Enter climatology   file identifier (7 characters)  ? GAGE_E1

 Enter the number of supply channels (1 - 3)  ? 1
 Enter the number of return channels (1 - 3)  ? 1

 Supply Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 3

 Return Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 3
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Area:  3
 --------
 Enter area            file identifier (7 characters)  ? AREA3
 Enter precipitation file identifier (7 characters)  ? GAGE_P1
 Enter climatology   file identifier (7 characters)  ? GAGE_E1

 Enter the number of supply channels (1 - 3)  ? 1
 Enter the number of return channels (1 - 3)  ? 1

 Supply Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 5

 Return Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 5
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Area:  4
 --------
 Enter area            file identifier (7 characters)  ? AREA4
 Enter precipitation file identifier (7 characters)  ? GAGE_P1
 Enter climatology    file identifier (7 characters)  ? GAGE_P2

 Enter the number of supply channels (1 - 3)  ? 1
 Enter the number of return channels (1 - 3)  ? 1

 Supply Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 4

 Return Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 4
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Area:  5
 --------
 Enter area            file identifier (7 characters)  ? AREA5
 Enter precipitation file identifier (7 characters)  ? GAGE_P1
 Enter climatology    file identifier (7 characters)  ? GAGE_E1

 Enter the number of supply channels (1 - 3)  ? 1
 Enter the number of return channels (1 - 3)  ? 1

 Supply Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 6

 Return Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 6
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Area:  6
 --------
 Enter area          file identifier (7 characters)  ? AREA6
 Enter precipitation file identifier (7 characters)  ? GAGE_P1
 Enter climatology   file identifier (7 characters)  ? GAGE_E1

 Enter the number of supply channels (1 - 3)  ? 1
 Enter the number of return channels (1 - 3)  ? 2

 Supply Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 0

 Return Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 0
                       Enter the percentage returned                ? 55
 Return Channel  2:    Enter the network node number ( 1- 8, or 0)  ? 4
                       Enter the percentage returned                ? 45
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
 Area:  7
 --------
 Enter area          file identifier (7 characters)  ? AREA7
 Enter precipitation file identifier (7 characters)  ? GAGE_P2
 Enter climatology   file identifier (7 characters)  ? GAGE_E1

 Enter the number of supply channels (1 - 3)  ? 1
 Enter the number of return channels (1 - 3)  ? 2

 Supply Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 0

 Return Channel  1:    Enter the network node number ( 1- 8, or 0)  ? 0
                       Enter the percentage returned                ? 30
 Return Channel  2:    Enter the network node number ( 1- 8, or 0)  ? 6
                       Enter the percentage returned                ? 70
```

```
WATER USE ANALYSIS MODEL    v7.0     MODULE5:  Create BASIN.DAT File
Acres International Ltd.
------------------------
   Node     Self    Upstream Downstream
    No.    Supply    Return    Supply
   ----    ------   -------- ----------
     1        0        0         0
     2        1        0         0
     3        1        0         0
     4        1        1         0
     5        1        0         0
     6        1        1         0
     7        0        0         0
     8        0        0         0

 End of Program.

C:\WUAM>
```

APPENDIX E9

SCREEN ECHO

Module 6

```
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 6: Generate Basin Hydrology
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\BASIN\BASIN.DAT
                                                     Node          Years
                                                  No    I.D.   No.  First Last
                                                  --  -------  ---  ----  ----
 Opening file  C:\WUAM\DATA\STREAMFL\HRSRVR01.DAT
                                                   1  RSRVR01   10  1912  1921
 Opening file  C:\WUAM\DATA\STREAMFL\HNODE_02.DAT
                                                   2  NODE_02   10  1912  1921
 Opening file  C:\WUAM\DATA\STREAMFL\HNODE_03.DAT
                                                   3  NODE_03   10  1912  1921
 Opening file  C:\WUAM\DATA\STREAMFL\HNODE_04.DAT
                                                   4  NODE_04   10  1912  1921
 Opening file  C:\WUAM\DATA\STREAMFL\HNODE_05.DAT
                                                   5  NODE_05   10  1912  1921
 Opening file  C:\WUAM\DATA\STREAMFL\HNODE_06.DAT
                                                   6  NODE_06   10  1912  1921
 Opening file  C:\WUAM\DATA\STREAMFL\HBNDRY07.DAT
                                                   7  BNDRY07   10  1912  1921
 Opening file  C:\WUAM\DATA\STREAMFL\HDUMMY08.DAT
                                                   8  DUMMY08   10  1912  1921

                                                  TOTAL BASIN   10  1912  1921

 Do you wish to continue  (Y or N)  ? Y
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 6: Generate Basin Hydrology
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\STREAMFL\HRSRVR01.DAT
 Opening file  C:\WUAM\DATA\STREAMFL\HNODE_02.DAT
 Opening file  C:\WUAM\DATA\STREAMFL\HNODE_03.DAT
 Opening file  C:\WUAM\DATA\STREAMFL\HNODE_04.DAT
 Opening file  C:\WUAM\DATA\STREAMFL\HNODE_05.DAT
 Opening file  C:\WUAM\DATA\STREAMFL\HNODE_06.DAT
 Opening file  C:\WUAM\DATA\STREAMFL\HBNDRY07.DAT
 Opening file  C:\WUAM\DATA\STREAMFL\HDUMMY08.DAT
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 6: Generate Basin Hydrology
Acres International Ltd.
------------------------

 The local supply at each node is calculated by subtracting the
 sum of the upstream flows from its flow.  You have a choice as
 to how the negative values (both input and calculated) will be
 handled.

 Options:  1 - negative values are left as the local supply,
           2 - negative values are set to zero.

 Choice  ? 2
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 6: Generate Basin Hydrology
Acres International Ltd.
------------------------
 Node:  8  (1 upstream nodes)
 Node:  7  (1 upstream nodes)
 Node:  6  (3 upstream nodes)
 Node:  5  (0 upstream nodes)
 Node:  4  (0 upstream nodes)
 Node:  3  (1 upstream nodes)
 Node:  2   (1 upstream nodes)
 Node:  1   (0 upstream nodes)
2JWATER USE ANALYSIS MODEL    v7.0     MODULE 6: Generate Basin Hydrology
Acres International Ltd.
------------------------

 You may select nodes for which you want a specific hydrologic
 record to override the local inflows just calculated.

 Nodes:      1 - RSRVR01       2 - NODE_02       3 - NODE_03       4 - NODE_04
             5 - NODE_05       6 - NODE_06       7 - BNDRY07       8 - DUMMY08


 Choice ( 1- 8, 999 for ALL, 0 to EXIT)  ? 0
2JWATER USE ANALYSIS MODEL    v7.0     MODULE 6: Generate Basin Hydrology
Acres International Ltd.
------------------------

 Creating output file  BASIN.HYD

 Opening file  C:\WUAM\DATA\BASIN\BASIN.HYD


 Basin hydrology is stored in file labelled "BASIN.HYD"



 End of Program.

C:\WUAM>
```

APPENDIX E10

SCREEN ECHO

Module 7

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 7: Generate Gauge Forecasts
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\GENERAL\FORECAST.DAT

 Number of Years: 25   (1982-2006)

 Choose forecast year  (1982 - 2006)          ? 1999

 Choose population growth scenario (1 -  5)  ? 1

 Choose livestock  growth scenario (1 -  3)  ? 1

 Choose industrial growth scenario (0 -  1)  ? 1
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 7: Generate Gauge Forecasts
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\GENERAL\FORECAST.DAT

 Number of Years: 25   (1982-2006)

 Choose forecast year  (1982 - 2006)          ? 1999

 Choose population growth scenario (1 -  5)  ? 1

 Choose livestock  growth scenario (1 -  3)  ? 1

 Choose industrial growth scenario (0 -  1)  ? 1

   Enter forecast scenario description (maximum 70 characters)
   ----------------------------------------------------------------------
 ? TEST RUN FOR USER MANUAL
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 7: Change Forecasted Demand
Acres International Ltd.
------------------------

 Additional changes may be made in final forecasted demand
 for each of the following regions:

 Regions:  0 - No further changes
           1 - BC
           2 - Alberta
           3 - Sask
           4 - Manitoba
           5 - Ontario
           6 - Quebec
           7 - NB
           8 - PEI
           9 - NS
          10 - Nfld

 Choice ? 0
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 7: Check For Price Changes
Acres International Ltd.
------------------------

 The effect of price changes on INDUSTRIAL INTAKE may be
 investigated by one of three methods.

 Options:  0 - No analysis
           1 - Use price    curves    method
           2 - Use price   equation   method
           3 - Use price  elasticity  method
 Choice ?  0
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 7: Check For Price Changes
Acres International Ltd.
------------------------

 The effect of price changes on DOMESTIC INTAKE may be
 investigated, using the pricing curve method only, for
 each of the following provinces:

 Province: 0 - No analysis
           1 - B. C.
           2 - Alberta
           3 - Saskatchewan
           4 - Manitoba

 Choice ?  0
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 7:  Generate Gauge Forecasts
Acres International Ltd.
------------------------
 Nodes:      1 - RSRVR01      2 - NODE_02      3 - NODE_03      4 - NODE_04
             5 - NODE_05      6 - NODE_06      7 - BNDRY07      8 - DUMMY08

 Choice ( 1- 8, 999 for ALL, 0 to EXIT)  ? 999
```

```
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7:  Generate Gauge Forecasts
Acres International Ltd.
-----------------------

 Node:  1 of  8
 I.D.: RSRVR01

 Opening file  C:\WUAM\DATA\GAUGE\GRSRVR01.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GRSRVR01.RUN
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7:  Generate Gauge Forecasts
Acres International Ltd.
-----------------------

 Node:  2 of  8
 I.D.: NODE_02

 Opening file  C:\WUAM\DATA\GAUGE\GNODE_02.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_02.RUN
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7:  Generate Gauge Forecasts
Acres International Ltd.
-----------------------

 Node:  3 of  8
 I.D.: NODE_03

 Opening file  C:\WUAM\DATA\GAUGE\GNODE_03.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_03.RUN
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7:  Generate Gauge Forecasts
Acres International Ltd.
-----------------------

 Node:  4 of  8
 I.D.: NODE_04

 Opening file  C:\WUAM\DATA\GAUGE\GNODE_04.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_04.RUN
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7:  Generate Gauge Forecasts
Acres International Ltd.
-----------------------

 Node:  5 of  8
 I.D.: NODE_05

 Opening file  C:\WUAM\DATA\GAUGE\GNODE_05.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_05.RUN
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7:  Generate Gauge Forecasts
Acres International Ltd.
-----------------------

 Node:  6 of  8
 I.D.: NODE_06

 Opening file  C:\WUAM\DATA\GAUGE\GNODE_06.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_06.RUN
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7:  Generate Gauge Forecasts
Acres International Ltd.
-----------------------

 Node:  7 of  8
 I.D.: BNDRY07

 Opening file  C:\WUAM\DATA\GAUGE\GBNDRY07.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GBNDRY07.RUN
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7:  Generate Gauge Forecasts
Acres International Ltd.
------------------------

 Node:  8 of  8
 I.D.: DUMMY08

 Opening file  C:\WUAM\DATA\GAUGE\GDUMMY08.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GDUMMY08.RUN
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7:  Generate Gauge Forecasts
Acres International Ltd.
------------------------

 Output is stored in file:  C:\WUAM\DATA\PRINTOUT\MODULE7



 End of Program.

C:\WUAM>
```

APPENDIX E11

SCREEN ECHO

Module 7B

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 7b: Irrigation Calculations
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\BASIN\BASIN.DAT
 Opening file  C:\WUAM\DATA\GENERAL\FORECAST.DAT

 Number of Years: 25   (1982-2006)

 Choose forecast year  (1982 - 2006)          ? 1999
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 7b: Check for Climate Change
Acres International Ltd.
------------------------

 Do you wish to investigate the effects of climatic changes (Y or N)  ? N
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 7b: Irrigation Calculations
Acres International Ltd.
------------------------
 Areas:       1 - AREA1         2 - AREA2         3 - AREA3         4 - AREA4
              5 - AREA5         6 - AREA6         7 - AREA7

 Choice (1- 7, or 0 to EXIT)   ? 1
```

```
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7b: Irrigation Calculations
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA1.DAT
     Area I.D.:       AREA1
     Area Name:       IRRIGATION AREA 1

     No. Scenarios:  1
     Description:        1987 TEST CASE SCENARIO
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7b: Irrigation Calculations
Acres International Ltd.
------------------------

 Checking all necessary data files . . .

 Opening file  C:\WUAM\DATA\EVAPOTRN\EGAGE_E1.DAT
 Opening file  C:\WUAM\DATA\PRECIPTN\PGAGE_P1.DAT

 evapotranspiration data record:  1912 - 1921

 precipitation       data record:  1912 - 1921

 overlapping period data record:  1912 - 1921     10 years

 Continue  (Y or N)  ? Y
 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA1.RUN
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE7B.OUT

 Calculating weighted irrigation parameters . . .
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7b: Irrigation Calculations
Acres International Ltd.
------------------------

 Starting the simulation . . .

 Year: 1912    1 of 10
 Year: 1913    2 of 10
 Year: 1914    3 of 10
 Year: 1915    4 of 10
 Year: 1916    5 of 10
 Year: 1917    6 of 10
 Year: 1918    7 of 10
 Year: 1919    8 of 10
 Year: 1920    9 of 10
 Year: 1921   10 of 10
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 7b: Irrigation Calculations
Acres International Ltd.
------------------------
 Areas:       1 - AREA1         2 - AREA2         3 - AREA3         4 - AREA4
              5 - AREA5         6 - AREA6         7 - AREA7

 Choice (1- 7, or 0 to EXIT)  ? 0

 Output is stored in file  MODULE7B.OUT


 End of Program.
```

APPENDIX E12

SCREEN ECHO

Module 7C

```
WATER USE ANALYSIS MODEL   v7.0     MODULE7C:  Electrical Submodel
Acres International Ltd.
------------------------
 Forecast year ?            1999
 Scenario number (1 - 1) ?  1
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE7C.OUT
 Opening file  C:\WUAM\DATA\ELECTRIC\THERMAL.RUN
 Opening file  C:\WUAM\DATA\ELECTRIC\HYDRO.RUN


 End of Program.

C:\WUAM>
```

APPENDIX E13

SCREEN ECHO

Module 8

```
JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Checking for Data Files
Acres International Ltd.
-------------------------
 Opening file  C:\WUAM\DATA\BASIN\BASIN.DAT
 Opening file  C:\WUAM\DATA\GAUGE\GRSRVR01.RUN
                                         Forecast Year: 1999

 Opening file  C:\WUAM\DATA\GAUGE\GNODE_02.RUN
                                         Forecast Year: 1999

 Opening file  C:\WUAM\DATA\GAUGE\GNODE_03.RUN
                                         Forecast Year: 1999

 Opening file  C:\WUAM\DATA\GAUGE\GNODE_04.RUN
                                         Forecast Year: 1999

 Opening file  C:\WUAM\DATA\GAUGE\GNODE_05.RUN
                                         Forecast Year: 1999

 Opening file  C:\WUAM\DATA\GAUGE\GNODE_06.RUN
                                         Forecast Year: 1999

 Opening file  C:\WUAM\DATA\GAUGE\GBNDRY07.RUN
                                         Forecast Year: 1999

 Opening file  C:\WUAM\DATA\GAUGE\GDUMMY08.RUN
                                         Forecast Year: 1999

 Opening file  C:\WUAM\DATA\BASIN\BASIN.HYD
                                         Number Years:    10 (1912-1921)

 Opening file  C:\WUAM\DATA\ELECTRIC\THERMAL.RUN
                                         Number Years:    10 (1912-1921)
                                         Forecast Year: 1999

 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA1.RUN
                                         Forecast Year: 1999
                                         Number Years:    10 (1912-1921)

 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA2.RUN
                                         Forecast Year: 1999
                                         Number Years:    10 (1912-1921)

 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA3.RUN
                                         Forecast Year: 1999
                                         Number Years:    10 (1912-1921)

 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA4.RUN
                                         Forecast Year: 1999
                                         Number Years:    10 (1912-1921)

 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA5.RUN
                                         Forecast Year: 1999
                                         Number Years:    10 (1912-1921)

 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA6.RUN
                                         Forecast Year: 1999
                                         Number Years:    10 (1912-1921)

 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA7.RUN
                                         Forecast Year: 1999
                                         Number Years:    10 (1912-1921)

 Opening file  C:\WUAM\DATA\STREAMFL\ERSRVR01.DAT
                                         Number Years:    10 (1912-1921)

 Opening file  C:\WUAM\DATA\STREAMFL\BBNDRY07.DAT
                                         Number Years:    10 (1912-1921)

 Overlapping period of record: 10 years  (1912-1921)

 Use this period of record  (Y or N)  ? Y
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Choose Simulation
Acres International Ltd.
-------------------------

 Choose type of simulation
 -------------------------
 Options: 1 - full simulation;     with    reservoir drawdowns
                                   with    consumption cutbacks
          2 - partial simulation; with    reservoir drawdowns
                                   without consumption cutbacks
          3 - partial simulation; without reservoir drawdowns
                                   with    consumption cutbacks
          4 - basic simulation;   without reservoir drawdowns
                                   without consumption cutbacks
 Choice ? 1


 Enter 2 lines of description (max 60 characters each)
         ------------------------------------------------------------
 Line 1: TEST RUN FOR USER MANUAL
 Line 2:
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Defining Network Layout
Acres International Ltd.
------------------------

 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE8.NET
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Averaging Local Inflow
Acres International Ltd.
------------------------
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Averaging Thermal Gen.
Acres International Ltd.
------------------------
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Averaging Irrigation
Acres International Ltd.
------------------------
                                                  Area:  1  I.D.: AREA1
 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA1.RUN
                                                  Area:  2  I.D.: AREA2
 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA2.RUN
                                                  Area:  3  I.D.: AREA3
 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA3.RUN
                                                  Area:  4  I.D.: AREA4
 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA4.RUN
                                                  Area:  5  I.D.: AREA5
 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA5.RUN
                                                  Area:  6  I.D.: AREA6
 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA6.RUN
                                                  Area:  7  I.D.: AREA7
 Opening file  C:\WUAM\DATA\IRRIGATN\IAREA7.RUN
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Averaging Evaporation
Acres International Ltd.
------------------------
                                             Reservoir:  1  I.D.: RSRVR01
 Opening file  C:\WUAM\DATA\STREAMFL\ERSRVR01.DAT
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Averaging Boundary Flows
Acres International Ltd.
------------------------
                                              Boundary:  1  I.D.: BNDRY07
 Opening file  C:\WUAM\DATA\STREAMFL\BBNDRY07.DAT
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Calculating Demands
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE8.DMD
                                                  Node:  1  I.D.: RSRVR01
 Opening file  C:\WUAM\DATA\GAUGE\GRSRVR01.RUN
                                                  Node:  2  I.D.: NODE_02
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_02.RUN
```

```
                                                  Node:  3  I.D.: NODE_03
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_03.RUN
                                                  Node:  4  I.D.: NODE_04
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_04.RUN
                                                  Node:  5  I.D.: NODE_05
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_05.RUN
                                                  Node:  6  I.D.: NODE_06
 Opening file  C:\WUAM\DATA\GAUGE\GNODE_06.RUN
                                                  Node:  7  I.D.: BNDRY07
 Opening file  C:\WUAM\DATA\GAUGE\GBNDRY07.RUN
                                                  Node:  8  I.D.: DUMMY08
 Opening file  C:\WUAM\DATA\GAUGE\GDUMMY08.RUN
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8: Check for Climate Changes
Acres International Ltd.
------------------------

 Do you wish to investigate the effects of climatic changes (Y or N)  ? N
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Historical Simulation
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE8.DTL

 Detailed Output Options:  1 - print every month
                           2 - print only violations
                           3 - skip this printout
                Choice ?  2
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE8.SNL
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE8.ANL
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE8.STG
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE8.RES
 Opening file  C:\WUAM\DATA\PRINTOUT\PLOTTER.RES
 Opening file  C:\WUAM\DATA\PRINTOUT\OUTFLOWS.DAT
2JWATER USE ANALYSIS MODEL   v7.0     MODULE 8:  Historical Simulation
Acres International Ltd.
------------------------
 Year: 1912  ( 1 of 10)
 Year: 1913  ( 2 of 10)
 Year: 1914  ( 3 of 10)
 Year: 1915  ( 4 of 10)
 Year: 1916  ( 5 of 10)
 Year: 1917  ( 6 of 10)
 Year: 1918  ( 7 of 10)
 Year: 1919  ( 8 of 10)
 Year: 1920  ( 9 of 10)
 Year: 1921  (10 of 10)
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE8.SUM
 Opening file  C:\WUAM\DATA\PRINTOUT\PLOTTER.SUM


 End of Program.

C:\WUAM>
```

APPENDIX E14

SCREEN ECHO

Module 9

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Checking for Data Files
Acres International Ltd.
------------------------
 Opening file  C:\WUAM\DATA\PRINTOUT\PLOTTER.SUM
 Opening file  C:\WUAM\DATA\PRINTOUT\PLOTTER.RES
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Output Devices
Acres International Ltd.
------------------------
     Output devices:  0 - EXIT
                      1 - screen:  HERCULES
                      2 - screen:  IBM CGA
                      3 - screen:  IBM EGA monochrome
                      4 - screen:  IBM EGA colour
                      5 - printer: EPSON FX-100 single density
                      6 - printer: EPSON FX-100 double density
                      7 - printer: EPSON FX-100 quad   density
                      8 - printer: HP Quietjet  single density
                      9 - printer: HP Quietjet  double density
                     10 - plotter: HP 7475 (9600 baud) line filled
                     11 - plotter: HP 7475 (9600 baud)solid filled
                     12 - plotter: HP 7585 (9600 baud) line filled
                     13 - plotter: HP 7585 (9600 baud)solid filled
                     14 - laser:   HP LASERJET (9600 baud) low res
                     15 - laser:   HP LASERJET (parallel ) hi  res

            Choice ?  1

     Scale factor ?  1
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Plot Choices
Acres International Ltd.
------------------------

            Options:  0 - RETURN to previous menu
                      1 - demand summary
                      2 - simulation summary
                      3 - node results
                      4 - reservoir results
                      5 - irrigation area results
            Choice ?
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Demand Summary
Acres International Ltd.
-----------------------


           Options:  0 - RETURN to previous menu
                     1 - intake
                     2 - consumption
                     3 - min. flow
           Choice ?  1

           Options:  0 - RETURN to previous menu
                     3 - seasonal
                     4 - annual
           Choice ?  3

       Device Type:  SCREEN
 PLOT88 ERROR #4      9 UNPLOTTABLE VECTORS
 PLOT88 ERROR #5     3 CLIPPED VECTORS
 READY TO DISPLAY OUTPUT.
 Please press <return> to continue.
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Simulation Summary
Acres International Ltd.
------------------------


           Options:  0 - RETURN to previous menu
                     1 - intake
                     2 - consumption
                     3 - min. flow
           Choice ?  1

           Options:  0 - RETURN to previous menu
                     1 - monthly
                     2 - total
                     3 - seasonal
                     4 - annual
           Choice ?  1
           Month  ?  3

       Device Type:  SCREEN
 PLOT88 ERROR #4     9 UNPLOTTABLE VECTORS
 PLOT88 ERROR #5     2 CLIPPED VECTORS
 READY TO DISPLAY OUTPUT.
 Please press <return> to continue.
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Get Node Number
Acres International Ltd.
------------------------
 Nodes:      1 - RSRVR01      2 - NODE_02      3 - NODE_03      4 - NODE_04
             5 - NODE_05      6 - NODE_06      7 - BNDRY07      8 - DUMMY08

 Choice ( 1- 8, 999 for ALL, 0 to EXIT)  ?
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Node Results
Acres International Ltd.
------------------------


              Node:  2 - NODE_02

           Options:  0 - RETURN to previous menu
                     1 - monthly supply/demand volumes
                     2 - streamflow time series
                     3 - irrigation time series
                     4 - boundary flow time series
                     5 - energy time series
           Choice ?  1
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Node Results
Acres International Ltd.
------------------------

  Options Available:  0 - RETURN to previous menu
                      1 - Avg. Supply     used for scaling
                      2 - Avg. Intake     used for scaling
                      3 - Avg. Consumed   used for scaling
                      4 - Avg. Outflow    used for scaling
                      5 - Min. Reqd Flow  used for scaling
                      6 - All Lines       used for scaling
           Choice ?   6
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Node Results
Acres International Ltd.
------------------------

        Device Type:  SCREEN

 Simulation Period:  1912 - 1921  (10 years)

       First Year ?
(or zero to EXIT)     1912
  Number of Years ?
(or zero to RETRY)   5
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Get Reservoir No.
Acres International Ltd.
------------------------


         Reservoirs:  0 - RETURN to previous menu
                      1 - Reservoir No. 1
            Choice ?
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Plot Choices
Acres International Ltd.
------------------------


          Reservoir:  1 - Reservoir No. 1

            Options:  0 - RETURN to previous menu
                      1 - elevation
                      2 - discharge
                      3 - inflow/outflow
            Choice ?  1

            Options:  0 - RETURN to previous menu
                      1 - time series
                      2 - summary
            Choice ?
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Get Area Number
Acres International Ltd.
------------------------
 Areas:       1 - AREA1         2 - AREA2         3 - AREA3         4 - AREA4
              5 - AREA5         6 - AREA6         7 - AREA7

 Choice (1- 7, or 0 to EXIT)   ?
```

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 9:  Get Area Number
Acres International Ltd.
------------------------

        Device Type:  SCREEN

 Simulation Period:  1912 - 1921  (10 years)

       First Year ?
(or zero to EXIT)     1912
  Number of Years ?
(or zero to RETRY)   5
```

APPENDIX E15

SCREEN ECHO

Module 10

```
WATER USE ANALYSIS MODEL   v7.0     MODULE 10:  Hydro Generation
Acres International Ltd.
-------------------------
 Opening file  C:\WUAM\DATA\ELECTRIC\HYDRO.RUN
 Opening file  C:\WUAM\DATA\PRINTOUT\MODULE10.OUT
 Opening file  C:\WUAM\DATA\PRINTOUT\PLOTTER.HYD
 Opening file  C:\WUAM\DATA\PRINTOUT\OUTFLOWS.DAT


 End of Program.

C:\WUAM>
```